MACHINERY

DESIGN — CONSTRUCTION — OPERATION

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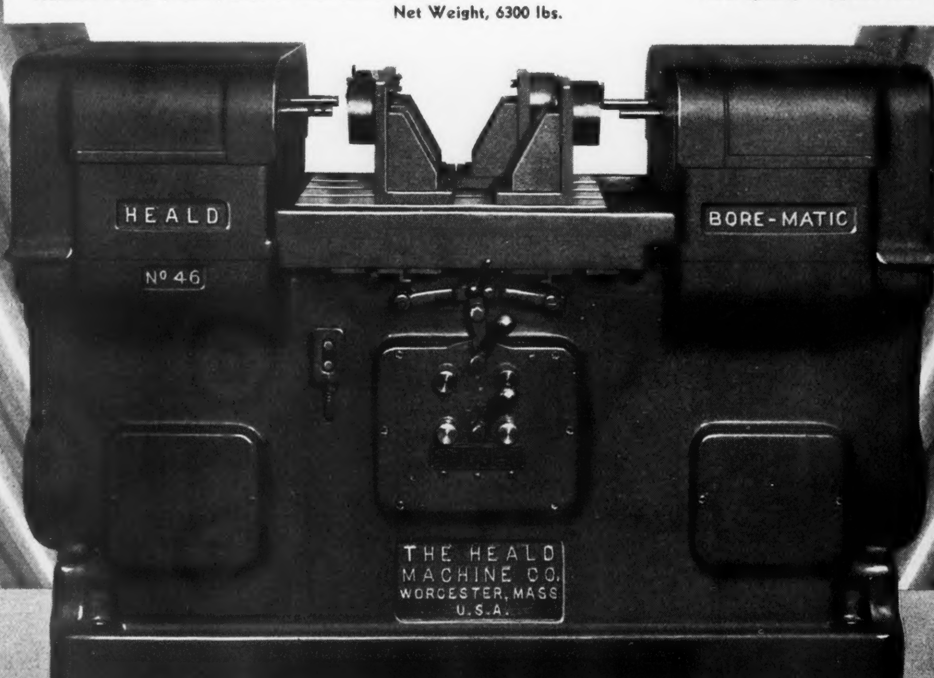

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HEALD

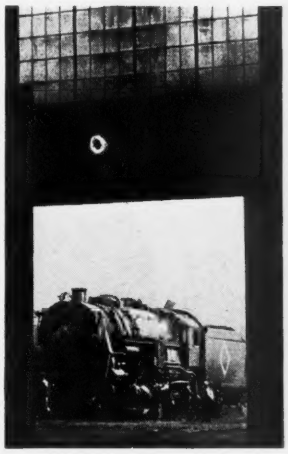
MACHINERY

Volume 37 NEW YORK, MAY, 1931 Number 9

Sixty-foot Locomotive Beds Made in One Piece

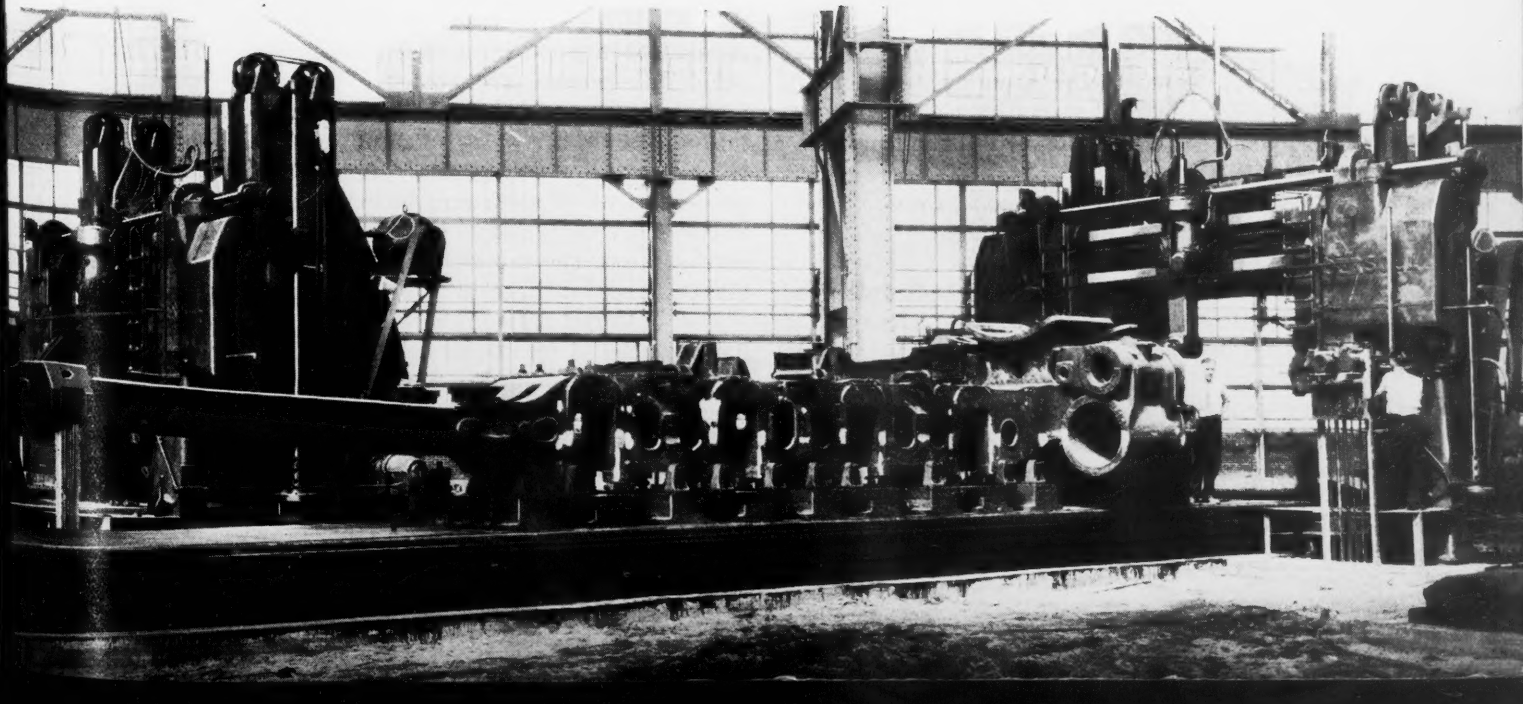
By CHARLES O. HERB

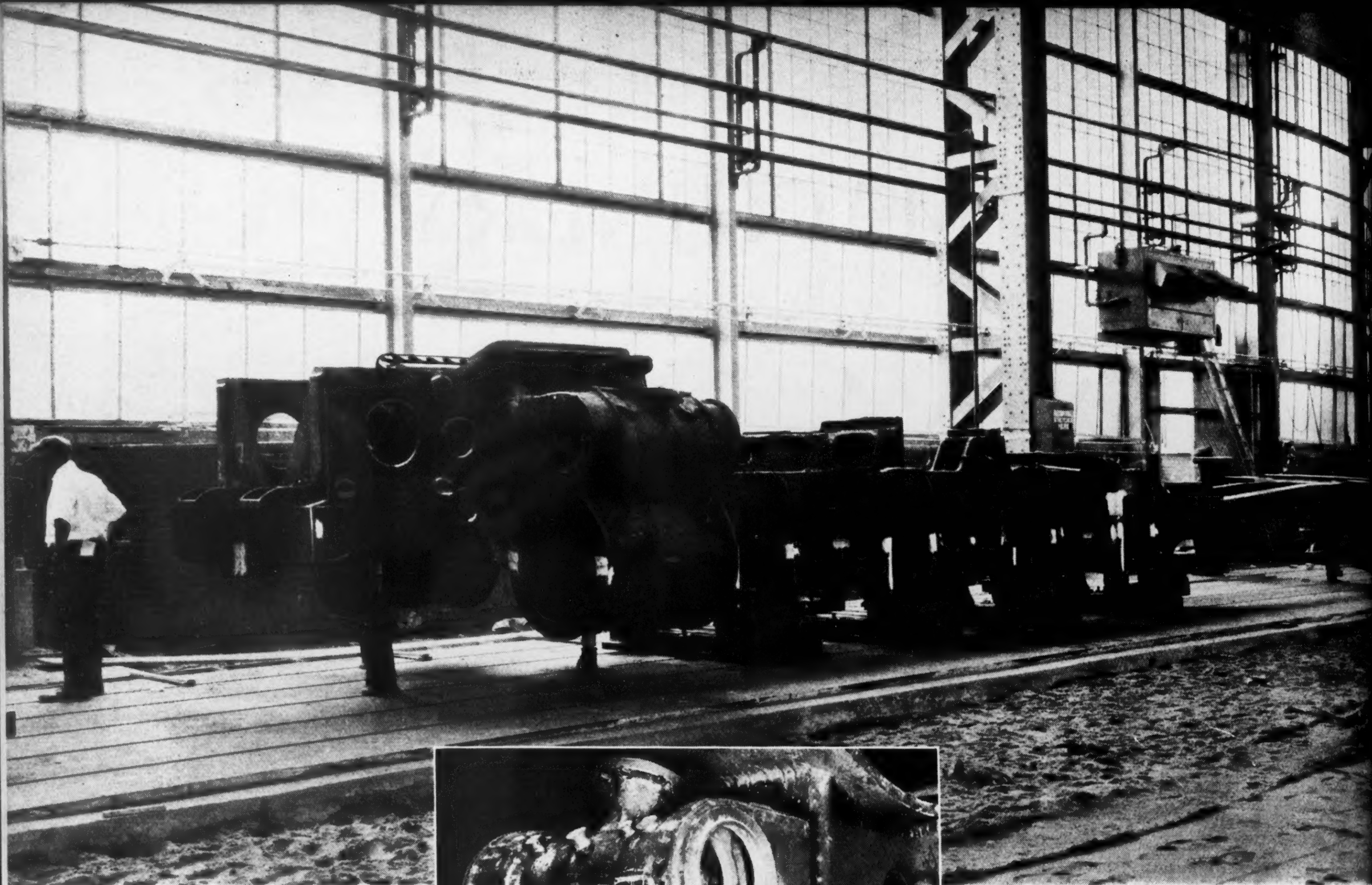
PROBABLY the most outstanding advance during recent years in the construction of steam locomotives has been the development of steel bed castings of the integral type. These locomotive "backbones" combine in a single casting the cylinders, slide-valve chambers, side frames, cross-braces, brake-hanger lugs, smoke-box support, firebox cradle, valve-motion brackets, and, in fact, practically everything but the boiler and the running gear. In some beds even a reservoir is included for compressed air. Hundreds of machined bolts and nuts required for attaching the separate parts in the built-up locomotive frame construction are eliminated.



These bed castings provide a foundation of maximum strength and minimum weight, which relieves the boiler of many stresses that it is called upon to withstand when the structure is less substantial. Rigidity of the locomotive frame is more readily maintained and uniform resistance is offered to stresses. Other important advantages are that the alignment of the locomotive wheels is more easily preserved and there is less likelihood of the driving-boxes becoming heated. Trouble from the connecting-rods and other parts of the running gear is also reduced. In view of these mechanical advantages, large savings are effected in repair costs. Bed castings have been produced in lengths of more than 60 feet and in weights up to approximately 40 tons.

For casting and machining these steam locomotive beds, as well as beds for tenders and electric loco-





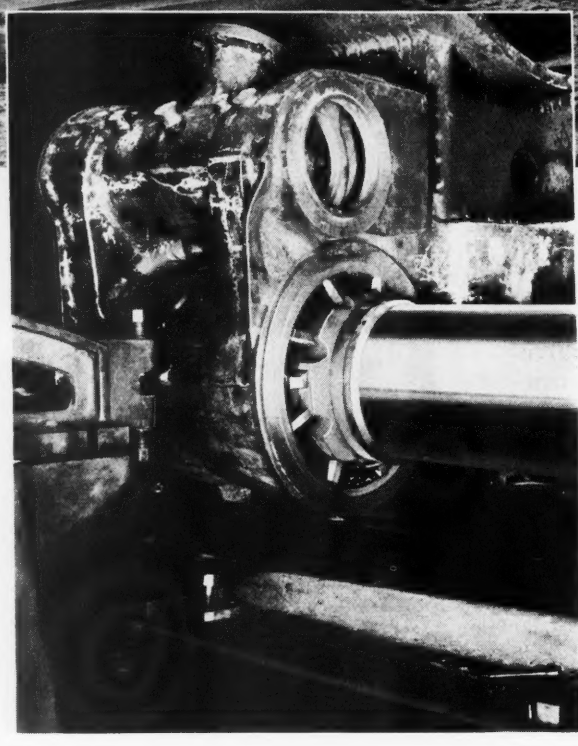


Fig. 1. The Locomotive Bed Castings are Set up on Jacks and Special Fixtures for Laying out before Machining

Fig. 2. Both Cylinders are Bored Simultaneously by Means of Multiple-tool Cutter-heads that are Fed Hydraulically

motives, a large plant was built during 1930 at Eddystone, Pa., by the General Steel Castings Corporation. The foundry is 1170 feet long by 270 feet wide, and has a capacity for producing 60,000 tons of basic open-hearth steel castings annually. The machine shop, of which a general view is shown in Fig. 6, is 1000 feet long by 192 feet wide, and is connected to the foundry by the chipping department. Typical operations performed in the machine shop will be described in the following.

A Five-hundred-ton Hydraulic Press Corrects Any Misalignment

At the point where the locomotive beds enter the machine shop, there is a huge hydraulic press which is employed for straightening the castings, when this is necessary. Five vertical cylinders are located on a cross-member of the press and there is a horizontal cylinder on both sides. Each ram actuated by these cylinders and their pistons exerts a pressure of 250 tons. Not more than two rams are used at a time, since the rating of the equipment is 500 tons.

Before any bed casting goes to a machine tool, it is taken to one of several large lay-out tables embedded in the shop floor, as illustrated in Fig. 1. Here the casting is set up on jacks and special fixtures for laying out. The fixtures are slotted to receive adjustable devices and clamps. These slots also facilitate fastening the fixtures to one another. The lay-out table and all machine tool tables have the same arrangement of slots and location points, and the fixtures are designed to suit these slots. Thus, the work or fixtures can be transferred from the floor plate to any machine and set up in minimum time.

Fig. 3 shows a locomotive bed just after a crane has lowered it on the table of a big Ingersoll rail type milling machine. The tables of the various machine tools are all 60 feet long.

Two rail type milling machines such as shown in Fig. 3 are employed for finishing various surfaces.

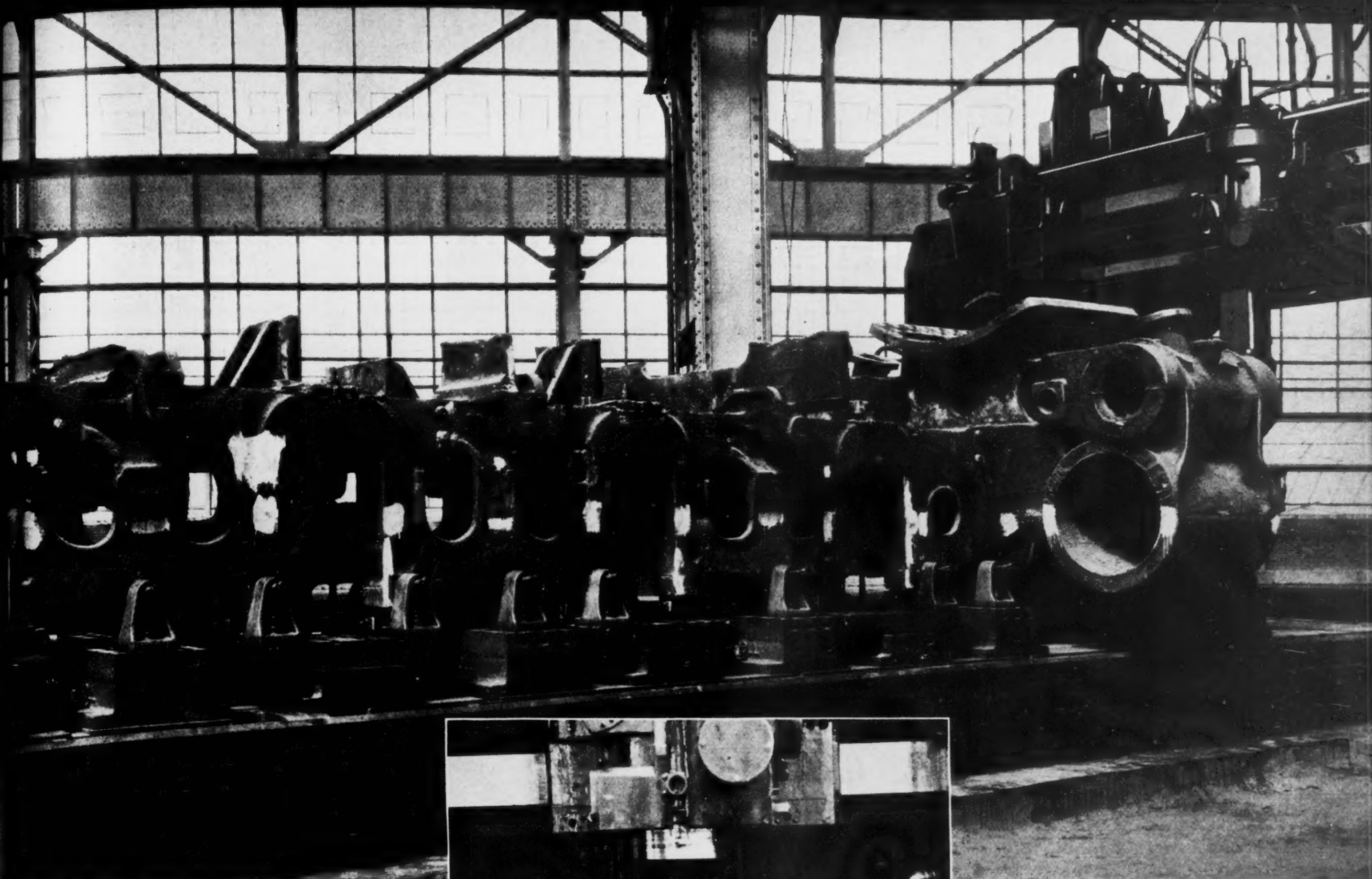


Fig. 3. Hugh Locomotive "Backbone" with Leveling Fixtures Attached, Set up on a Rail Type Milling Machine

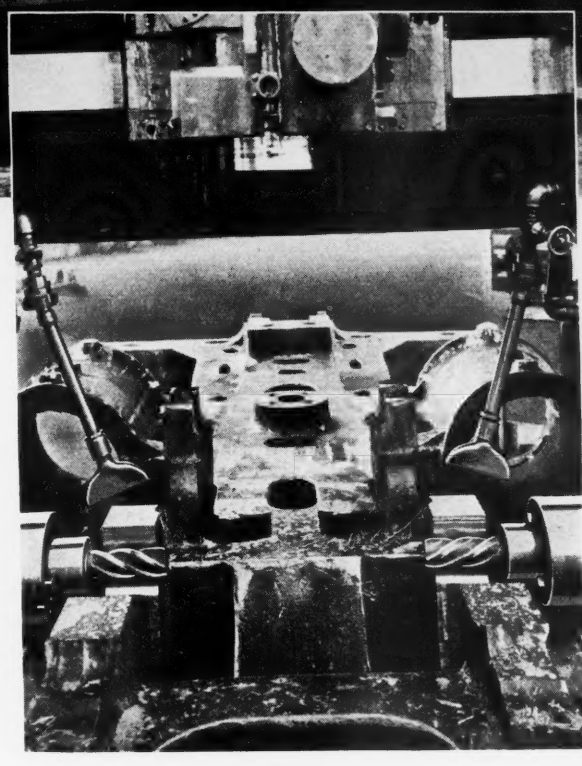


Fig. 4. Opposing Pedestals are Milled Simultaneously by Moving Side-heads Vertically and Table Longitudinally

One of the most interesting operations performed on these machines consists of milling the pedestals. Each pedestal is milled in two steps, first with cutters such as shown in Fig. 4, and then with straddle mills, which are employed to mill at right angles along the outside and inside of the pedestal surfaces to obtain the desired thickness.

Opposing pedestals are milled simultaneously by feeding the side-heads of the machine vertically for milling the pedestal sides, and the table longitudinally for finishing the top and bottom surfaces. One side of each pedestal is tapered, and consequently, when this side is being milled, the table is fed forward at the necessary speed, in conjunction with the vertical movement of the side-heads. Various face-milling cuts are taken by the rail-head, such integral members of the bed as the link yokes and guide yokes also being finished by milling. The distance between the machine housings is 146 inches.

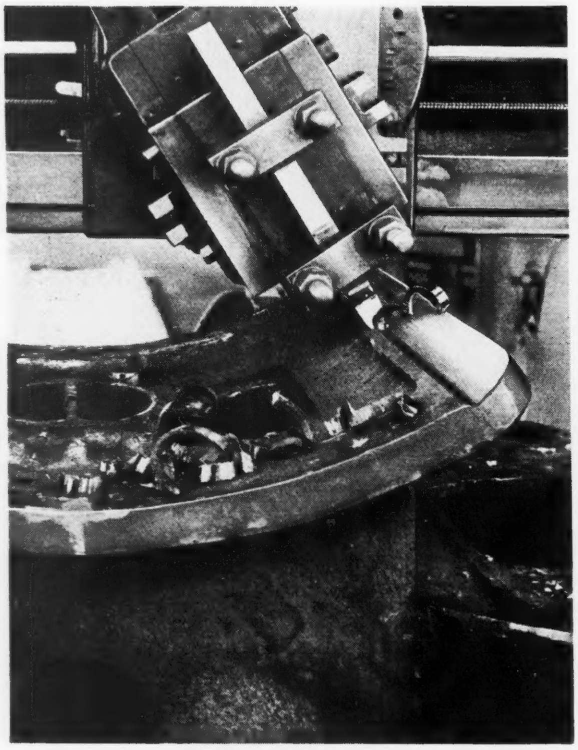
All drilling of the bed is done on a machine built by the Consolidated Machine Tool Corporation, having the general construction of a planer fitted with both rail- and side-heads. These heads are provided with drill spindles and can be swiveled to drill holes at any desired angle. The rail-head is equipped with a right angle drilling attachment for drilling holes so located that they cannot be reached by the side-heads.

How the Smoke-box Support is Planed to a Radius

Planing operations are performed on machines built by the Niles Tool Works Co. One of the most interesting jobs is that of machining the smoke-box support; this is illustrated in Fig. 5. The rail-head is of a special design which swivels at a predetermined radius as it is fed horizontally along the rail, so as to finish the surface to the required radius. Another interesting planing operation is that of finishing the steam ports to various angles.

A special machine built by the Ingersoll Milling Machine Co. rough- and finish-bores the cylinders,

Fig. 5. Smoke-box Supports are Planed to a Radius by Means of a Head that Swivels while it is Fed Across Rail



cuts being taken on both cylinders simultaneously. In the roughing operation, illustrated in Fig. 2, from 5/8 to 7/8 inch of stock is removed in one cut by the use of heads having eight roughing tools. These tools are adjustable radially. The cutter-heads are fed hydraulically through the cylinders at the rate of 3 inches per minute while revolving sixty times per minute.

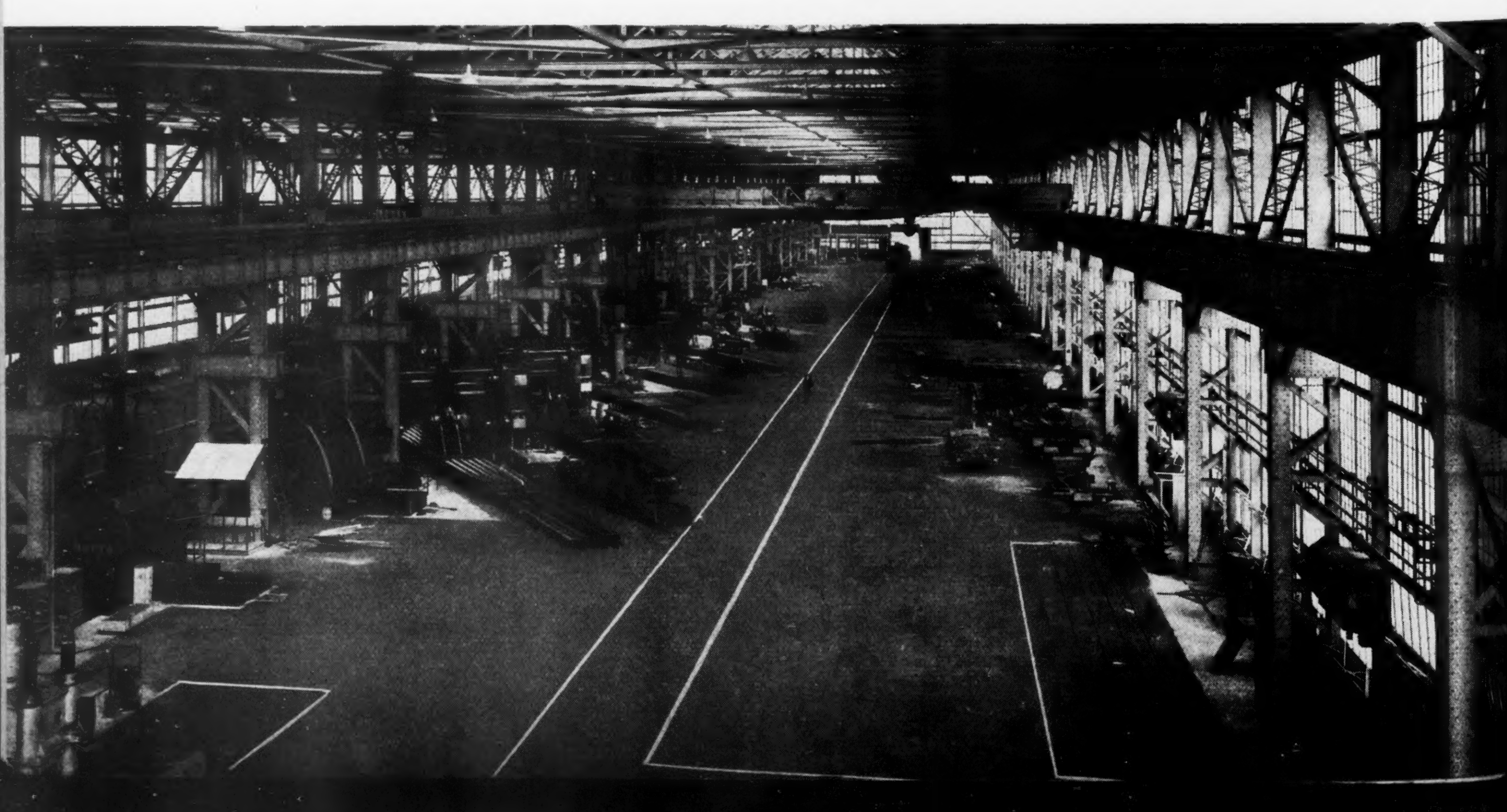
The same cutter-heads are employed for the finishing cuts, a separate tool being adjusted outward for this operation. The cylinders are finished to size within 0.010 inch. Tools fastened to the side of the cutter-heads are also employed for facing both ends of the cylinders. A counterbore and stepped cylinder bore are produced by resetting the cutter-heads. Both cutter-spindles are adjustable sidewise to suit different center distances between the cylinders.

A somewhat similar machine built by the same concern is employed for boring the slide-valve chambers above the cylinders. Separate cutter-heads are used for facing the ends of the chambers. Different fixtures are provided on this machine, and on the cylinder boring machine to position the locomotive beds accurately for the operation. The boring heads are located sidewise with precision by the use of gage-blocks.

After the locomotive bed frames have been completely machined, various hand tools, such as hammers and grinders, are used on unfinished surfaces to improve the appearance. Simple welds are also made for the same reason.

The methods outlined in the present article indicate the great changes that have taken place both in locomotive design and in foundry and machine shop practice during the last few years. It is difficult to say whether the change in design of locomotive frames, for example, has been responsible for these new foundry and machining methods or whether the possibility of casting and machining such tremendously large units has brought about the improvements in design. It was useless to design a locomotive frame as described unless it could be cast and machined; but given methods capable of producing such work, the advantages of the integral design are obvious.

Fig. 6. The Machining Operations are Performed in a Thoroughly Modern Shop 1000 Feet Long



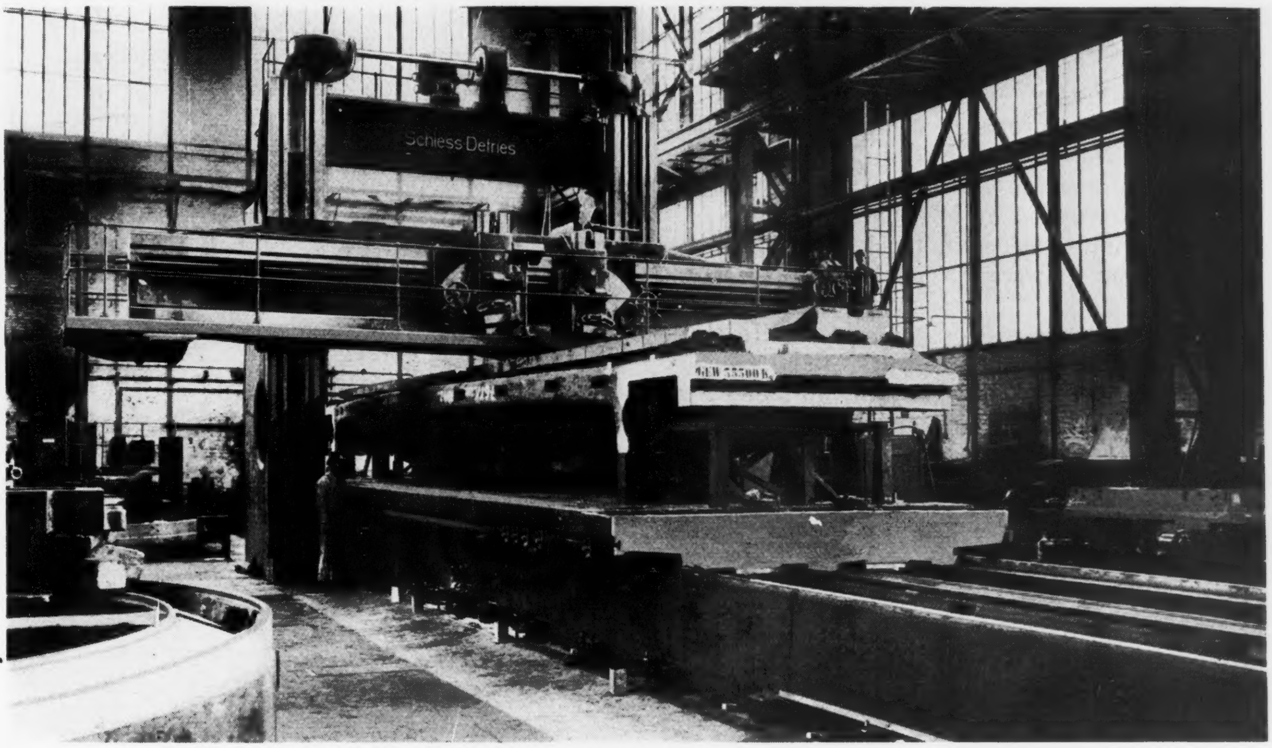
A Course in Management

The sixteenth annual brief course in management problems conducted at the Pennsylvania State College, State College, Pa., will be held this year from June 10 to 18. The course will be in charge of Professor J. O. Keller, head of the Engineering Extension Department.

This course in management was organized in 1914 by Hugo Diemer, well-known industrial engineer, and during the last fifteen years has attracted many executives from the northeastern part of the United States. The executives taking the course live on the campus, the course being held during the student vacation period. They attend classes in the college rooms and laboratories, and meet with their instructors three times a day to consider problems of management, production control, personnel, time and operation study, purchasing, cost accounting, and problems of a similar nature.

The course lays stress on actual plant problems and conditions. All instructors are men who have been engaged in industry and who are able to present practical solutions to industrial problems. For the time-study work, the college machine shop is used. One of the features of the course is a demonstration of the conference method of training foremen.

The executives attending the course actually have a profitable vacation, for State College is situated in the center of the Pennsylvania hills, providing opportunities for all kinds of outdoor exercise. Those who have attended these courses in the past have returned to their own plants convinced that the exchange of views, the study of new tendencies in industry, and the acquaintances formed were well worth the time spent.



A View in the Schiess-Defries Machine Tool Plant at Dusseldorf, Germany, Showing a Planer 13 by 11 Feet, with a Bed 103 Feet Long, Driven by Two Motors Totaling 100 Horsepower

Properties of Zinc Die-castings

In a paper on zinc and zinc alloys used in the automotive industry, read before the annual meeting of the Society of Automotive Engineers at Detroit in January, Robert M. Curts of the New Jersey Zinc Co., New York City, gave a list of the properties of a zinc alloy for die-castings composed of 4 per cent of aluminum, 3 per cent of copper, from 0.05 to 0.1 per cent of magnesium, the balance being Horse Head special zinc. From this tabulation the following figures are quoted:

Specific gravity, 6.8; melting point, 393 degrees C. (740 degrees F.); tensile strength, 47,500 pounds per square inch (a tensile strength in excess of this can be obtained under certain casting conditions); elongation in 2 inches, from 3.7 to 4.3 per cent; impact value, in excess of 125 foot-pounds per square inch; compressive strength, 90,000 pounds per square inch; Brinell hardness (10-millimeter ball with 500-kilogram load for 30 seconds), 85; Shore scleroscope hardness, 33; Rockwell hardness (red figures on E scale), 93; and thermal expansion per unit length (between 25 and 100 degrees C.), 0.0000295 per degree C. (0.0000164 per degree F.).

Broaching Screw-head Slots on a Planer

Unusual Operation Performed on a Planer When Special Automatic Equipment Was Not Available

By H. C. MEYERS, Grand Haven, Mich.

SLOTTING the heads of screws is usually a slow operation unless automatic machinery is available. With the fixture shown in Fig. 1, however, between 2400 and 3000 screws can be slotted per hour, depending upon the speed of the operator. The operation is performed on a planer, a rather unusual machine to use for the purpose, but in this case quite effective. The fixture is bolted to the table, as indicated at *J*.

Four broaches *F* are secured in the side of a channel extending the entire length of the fixture, the teeth of these broaches protruding a suitable distance from the sides of the channel. The broaches are securely clamped by means of the tapered gibs *B* which are tightened by nuts on the studs *G*. In the channel may be seen the block *D* which serves as a holder for the screws while they are being slotted.

Twenty-four holes are drilled and counterbored in block *D* to receive the screws. The block is placed in one end of the fixture and slid along until the first set of screws comes in contact with the shallow end of the broaches. As the planer table moves to the left, the block comes in contact with the square bar *L* secured in the toolpost of the planer head. When the planer table continues to move toward the left, this bar forces block *D* along the channel of the fixture, and during this movement, the screw slots are cut to the required depth by the broaches *F*.

The table has sufficient travel to carry the screws past the ends of the broaches. At this point, the block containing the slotted screws is removed from the right-hand end of the fixture and the movement of the table is reversed. Upon the return of the table to its starting position, another block filled with screws is placed in the left-hand end of the fixture, so that when the planer table once more begins its forward stroke, the bar *L* carries the block through the fixture channel and another lot of screws is slotted by the broaches.

The planer is operated at 100 strokes per hour to provide a suitable speed for the broaches and at the same time allow sufficient time for the operator to load a block while a set of screws is being slotted. In order to prevent the block from jamming when

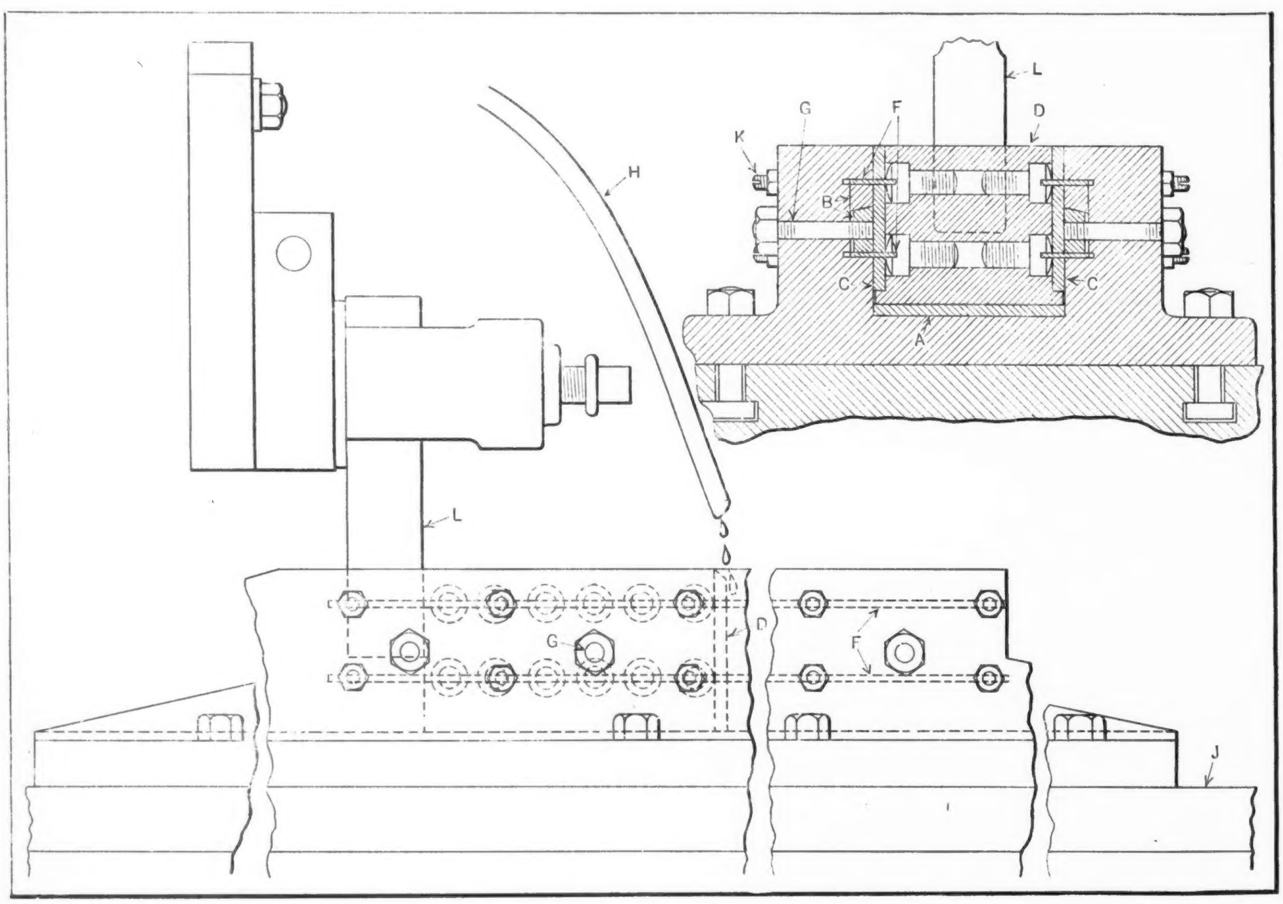


Fig. 1. Planer Set-up in which Twenty-four Screws are Slotted at Every Stroke of the Table

started into the channel and to facilitate unloading, the sides of the fixture are cut down at both ends. The broaches are adjusted for depth by the adjusting screws K against which the broaches rest. After being adjusted, they are locked securely in place by means of check-nuts.

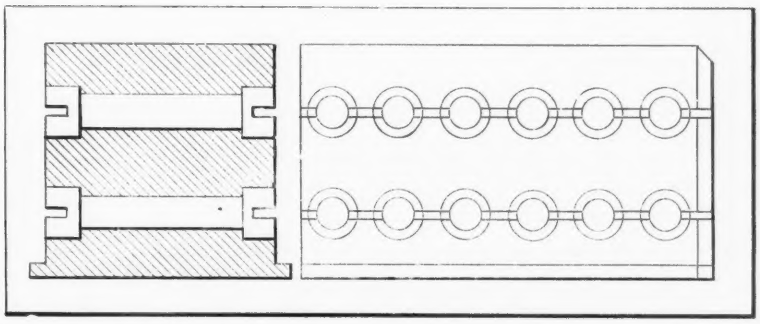


Fig. 2. Holder for Screws Slotted in Fixture Shown in Fig. 1

The broaches are 36 inches long and have approximately 120 teeth, the cutting depth for each tooth being slightly less than 0.001 inch. Cutting fluid is supplied from a container fastened to the planer rail. This fluid flows through the tube H, and drips on the broach teeth directly ahead of the block, as indicated. The channel is freed from chips by a blast of air, which is applied automatically during the return stroke of the table.

A detail view of one of the work-holding blocks is shown in Fig. 2. In the sectional view at the left, it will be noted that projections are provided on each side to engage openings left between the bottoms of the liners C and the liner A, Fig. 1. With this arrangement, the block is confined to the bottom of the channel, thus preventing any lifting movement due to the cutting action of the broaches. It will also be seen that one end of the block is beveled to facilitate starting it into the channel.

In order to obtain production figures on this operation, a time study was made from which the following results were derived:

Removing a block from fixture......	0.08 minute
Removing screws from block........	0.05 minute
Removing chips from block with compressed air......................	0.05 minute
Loading screws into block..........	0.35 minute
Placing block in fixture............	0.05 minute
Total.........................	0.58 minute

As the machine makes one complete cycle in 0.6 minute, the operator has ample time to load the spare block before the table reaches its starting position again, thus making the operation a continuous one.

New England Manufacturers Outline Industrial Program

The New England Council has requested hundreds of executives in the New England industries to formulate recommendations for a 1931 industrial working program. The recommendations made, in the order of the number of endorsements of each, are as follows:

Hold lay-offs to a minimum; reduce weekly hours rather than number of men employed; push sales aggressively and intelligently; determine which lines have the best turnover and contribute most to net profits; determine who are the most profitable customers to serve and which are the territories that yield the most profits; concentrate on sales that are most profitable, and eliminate wasteful business.

Increase the interest of the employes in the welfare of the business by keeping them informed on the progress of the company's efforts toward maintaining steady work for them. Maintain wages and working conditions on a level creditable to the community. Give every employe, as far as possible, an opportunity to take pride in his work and to feel that his services are necessary to the company's success. A friendly management, human in all its dealings and considerate of the workers' interests, wins their cooperation. Encourage normal buying for normal needs by those having a steady income.

Clean up, paint, and repair in and around plants. This is a good time for a general housecleaning. Overhaul machinery and equipment. Adopt research and modernize plants; install modern machinery and up-to-date power and lighting equipment. Introduce material-handling means to lower handling costs. Invite employes' suggestions for eliminating waste.

Plan and budget sales and production, as well as sales and production expense. Establish adequate standards of quality and performance, with suitable incentives and rewards for their attainment and maintenance. Cooperate with the community in the registration of the unemployed. Encourage accurate local publicity on local business conditions and extent of employment. Encourage exchange of information between New England communities on opportunity for work, in order to avoid unwarranted travel expenditure by men seeking work.

* * *

A motor truck recently developed in England is provided with a belt conveyor to facilitate loading and unloading. The floor of the truck is provided with an endless rubber belt running over a succession of rollers. In this way, the truck can be loaded quickly and the load can be discharged rapidly.

Notes and Comment on Engineering Topics

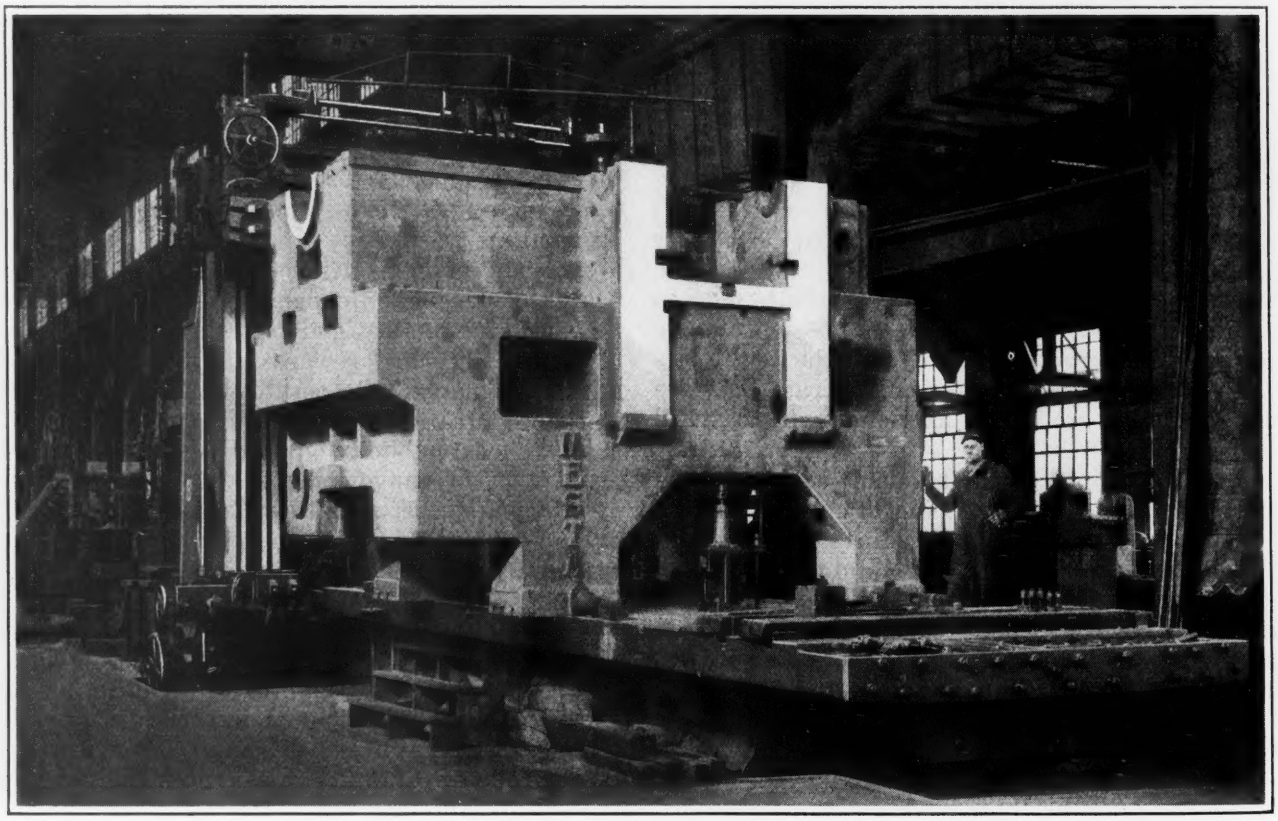
The increasing field of application of stainless steel is indicated by the fact that about $500,000 worth of this material has been used for window trim and other decorative work in the new eighty-five-story Empire State Building recently erected in New York City.

Plans have been approved for building a vehicular tunnel under the river Thames in London. The tunnel will have a 19-foot wide roadway with sufficient head-room for double-decked omnibuses. It is estimated that it will require about three and one-half years to complete the tunnel, the cost of which will be $18,000,000.

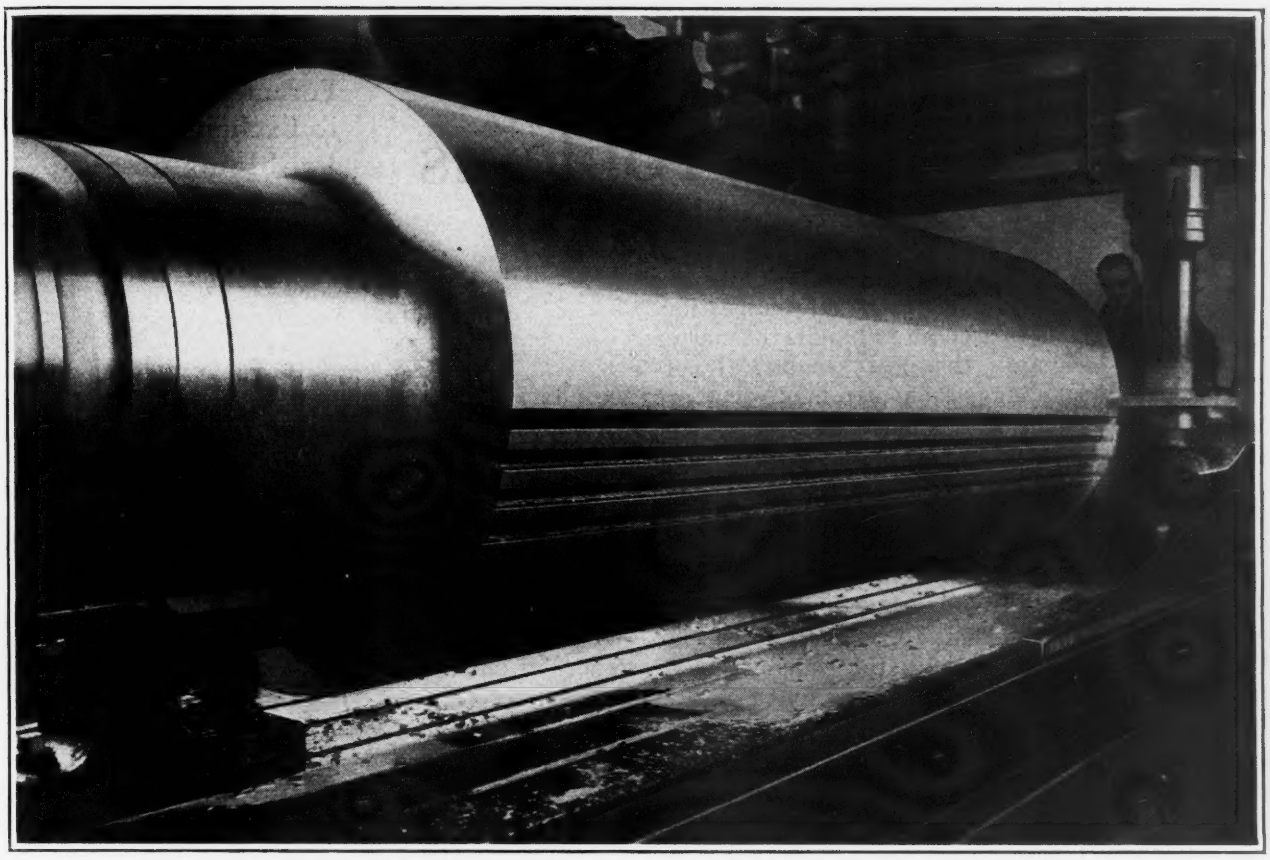
About two years ago the Gaffney Mfg. Co., Gaffney, S. C., installed 324 ball-bearing hanger boxes on loom drive shafts. According to information obtained from the Fafnir Bearing Co., New Britain, Conn., these hanger boxes have reduced the power consumption by 10 per cent. Careful test runs have been made, and as a result, it has been determined that the total yearly saving resulting from the use of ball-bearing hanger boxes is close to $900, including the savings in power consumption, oil, and labor. On this basis, the installation will pay for itself in three years.

An aerial transportation "bridge" is being built across the harbor of Barcelona in Spain for passenger traffic. It runs about 200 feet above the water level, the heavy cable supporting it being attached to three immense towers on each side. The four cars used for transportation seat twenty-two people each, and make the run of a mile between terminals in three minutes.

Tantalum, one of the chemical elements, is a metal that has come into considerable use of late because of its ability to resist the action of all acids except hydrofluoric acid, and all alkalis except hot concentrated caustic soda. It is not even attacked by aqua regia, which dissolves gold and platinum. The metal has a high tensile strength—130,000 pounds per square



The Cast-steel Frame for a 1000-ton Bloom Shear Being Machined on a 14-foot Planer at the Mesta Machine Co.'s Plant, Pittsburgh



Slotting the Rotor of a Giant Electric Generator that is Being Built at the Schenectady Works of the General Electric Co.

inch—which adapts it for many purposes for which other corrosion-resisting materials of less strength would be unsuitable. The melting point of tantalum is 2850 degrees C. (approximately 5160 degrees F.). The only other metal having a higher melting point is tungsten. Tantalum is now used to a considerable extent in the chemical industries, in laboratory work, and in making tantalum-carbide cutting tools. Because of its peculiar property of passing electric current in one direction only, it is also used in electrical rectifiers and high-capacity electrolytic condensers.

Australian engineers have been very progressive in the application of welding to the construction of oil tanks. In a paper read before the Australian Institute of Engineers at Melbourne, D. S. Baldwin described the welding of oil storage tanks up to 3,000,000 gallons capacity. It is stated that the process has been very successful in its applications in Australia.

A new device, known as the photo-electric relay, has been developed by the General Electric Co. By means of this device, the interruption of a beam of light makes it possible to control the operation of industrial machinery. A machine, for example, having a table traveling in a certain direction for a given distance, which must then be stopped and reversed, may be controlled in this manner. When a table has run the limit of its travel, it interrupts a beam of light falling on a photo-electric tube, and thus causes the control device to function. The new device can be operated at high speeds, 100 times a minute being the maximum at present. It is stated that it can be easily installed and that its operation can be adjusted or changed without difficulty.

Fireless locomotives are used in the factory yards of the National Cash Register Co.'s plant at Dayton, Ohio. This type of locomotive has no firebox, nor does it have any boiler in the ordinary sense of the word. It is merely provided with a steam storage tank which is charged with high-pressure steam at the factory's power house. This steam operates the engine pistons the same as in an ordinary locomotive. One charge of steam is sufficient to run the engine for several hours.

There is an interesting story in connection with the acquisition of these engines. Mr. Patterson, founder of the business, saw one of these fireless locomotives operating in the yard of a plant while traveling in Germany. He became much interested and immediately saw how it could be applied in his factory at Dayton. He assumed, of course, that the engines were built in Germany and asked who the manufacturer was, so that he could get in touch with him while he was over there. To his surprise, he was informed that these engines were manufactured in Lima, Ohio, a comparatively few miles from his own factory in Dayton.

The Shop Executive and His Problems

Superintendents and Foremen are Invited to Exchange Ideas on Problems of Shop Management and Employe Relations

WHEN a man makes a worthwhile suggestion, how ought the foreman to handle the matter so as to obtain the best results? Generally speaking, when suggestions are made that are worthwhile, the man who makes them should be told that the idea is appreciated; the broadminded foreman will also see that the superintendent is informed of any suggestions made by his men.

The credit for the suggestion should go directly to the workman. If possible, the superintendent should be informed in the presence of the man who made the suggestion. The foreman will receive credit for being able to obtain the cooperation of his men. If the men in general believe that the foreman takes the credit for their ideas, no more suggestions will be forthcoming, and in the long run the foreman will be the loser.

JOHN A. HONEGGER

Should Everybody be Treated Alike?

In most shops, a distinction is made between the privileges accorded office employes and shop employes. Is it advisable to grant to one group of employes privileges that cannot be extended to all? For instance, office workers are often permitted to make and receive personal telephone calls during working hours, while shop men are not. Why should one group be permitted to bring personal affairs into the shop and the other not? Should the foreman or his clerk be granted any special privileges denied to other men in the department?

Great care should be taken not to make arbitrary shop rules. When rules are made without apparent reason, and the reason remains unexplained, difficulties, misunderstandings, and ill feeling arise. Most men are reasonable, and if they understand why certain rules must be adhered to, they will generally cooperate with the management.

H. L. LACKMAN

When is a Machine Tool Obsolete?

It is not easy to give a rule or formula that will answer the question "When is a machine tool obsolete?" Opinions differ in regard not only to machine tools, but other things as well. Some automobile owners declare that a car "wears out" in one year, and trade in their cars annually; but the old car continues to run for a number of years in the hands of subsequent owners. In some steam-power plants a ten-year old engine or turbine is junked and replaced by more efficient and more economical apparatus. The same equipment in less progressive plants is kept another ten years or more.

Is there, then, no rule that can be applied? With reference to machine tools, there certainly is, and the rule is this: A machine tool is obsolete as soon as it will *pay* to replace it.

Simply because we can get along with an old machine, we have no proof that it is not obsolete. There is entirely too much machinery in daily use that is obsolete. It should be replaced because it will *pay* to replace it.

This is also true of other shop equipment. For instance, a power transmission belt, eight years old, will pull a full load immediately after tightening; but it stretches quickly, slips, and must be retightened often. It is too old—its elasticity is gone. The cost of frequent retightening, the cost of lost power due to slip, and the loss in production are factors that would make it pay to install a new belt.

W. F. SCHAPHORST

How Can Graduate Apprentices Obtain Adequate Experience?

Graduate apprentices can broaden their experience only by working in shops other than the one in which they have been trained. How can this experience be obtained without the training shop losing the apprentice?

Two large plants having apprentice schools have solved this problem in the following manner: At the end of the apprentice training period, the young men in the two schools are exchanged for six months. The apprentice contract calls for this extra six months of service, and the graduation bonus, set of tools, and diploma are not granted until the six months have been completed. The young men then return to the employ of the firm that has trained them. Only one apprentice has been lost in three years.

A considerable advantage is gained from the fact that the two machine shops exchanging apprentices manufacture products entirely different, so that the apprentices obtain an entirely new experience. The method could be adopted to advantage by other manufacturers. The apprentices will appreciate the opportunity of gaining added experience without actually having to leave the employ of the firm that has trained them.

CHARLES R. WHITEHOUSE

Milan Engineering Exposition

An engineering exposition of considerable proportions was held in Milan, Italy, April 12 to 27. While the exposition covered almost every branch of engineering, one of the central features was the machine tool exhibition housed in the Palace of Mechanics. A great many of the leading American machine tool manufacturers were represented through their Italian agents. Many of the machines exhibited were shown in actual operation.

The Italian Government is encouraging the policy of replacing obsolete machinery by exempting from duty special machinery that is imported primarily for the purpose of enabling Italian factories to produce, with greater efficiency, such industrial products as are particularly required for domestic consumption.

We are indebted to Societa Anonima Emanuele Mascherpa of Milan, importers of American machine tools, for the information and photographs relating to the exposition. This firm occupied six booths exhibiting American lathes, shapers, drilling machines, honing machines, grinding machines, milling machines, and electric and pneumatic tools. Many of the American plants had sent expert demonstrators to the exposition to assist their agents in showing the machinery in actual operation. Our correspondents express the belief that the results from the exhibition will prove its value, and that an increasing number of American machine tool manufacturers, in the future, will avail themselves of this means of reaching the Italian market as well as the general Southern European market.

The Palace of Mechanics in Milan, Italy, where, on April 12 to 27, a Large Engineering Exposition was Held

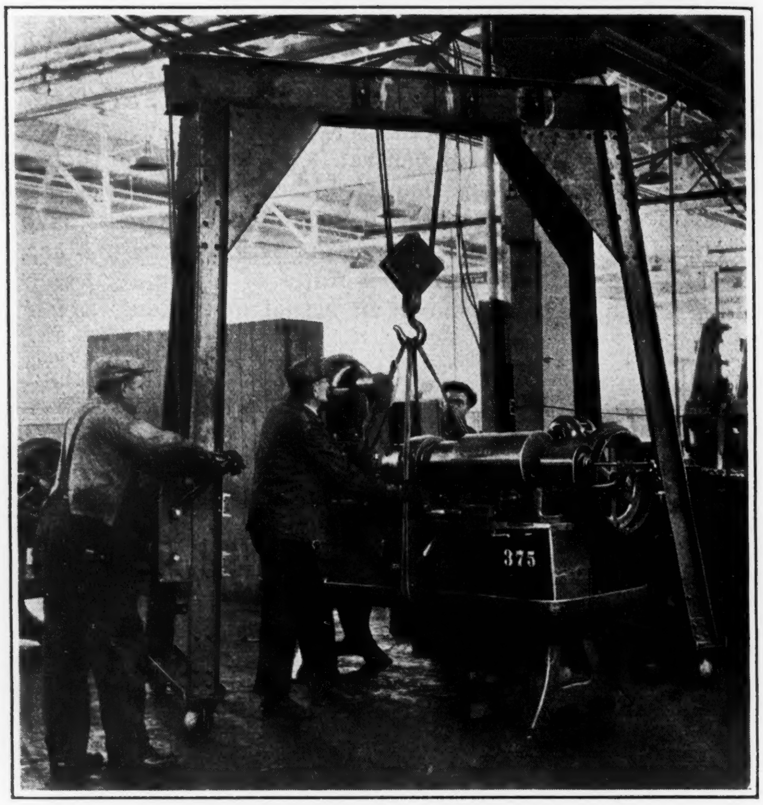
Machine Tools and Shop Equipment Formed an Important Part of the Exposition—Many American Tools were Shown

The Milan Fair has grown in importance from year to year. It offers an opportunity to exhibit American machinery and tools in Southern Europe similar to that provided by the Leipzig Fair in Northern Europe. At the present time, especially, an exhibition of American machine tools should have satisfactory results, because many Italian plants are realizing more and more the importance of replacing obsolete machinery with modern types, if they are to hold their own under the present conditions of keen competition which has been stimulated by the business depression of the last two years.

Moving a Large Machine Shop

Careful Planning Made it Possible to Move the Equipment of a Large Aircraft Plant from its Old Location into New Buildings Four Miles Away in Five Days

By BERAN VON LINDEN LANSDOWNE



Portable Frame Provided with Block and Tackle for Lifting Machines onto Skids or Trucks

AMONG the difficult jobs that production and plant engineers are sometimes required to handle is the moving of a plant from one location to another. One of the most interesting plant transfers on record is that of the Pratt & Whitney Aircraft Co., which was effected in five days without any material slowing up of the production of airplane engines.

The old plant is located in the center of the manufacturing district of Hartford, Conn., while the new plant is located across the Connecticut River in East Hartford. The machines were moved by being loaded on electric freight cars and trucks. The flat electric cars hauled the heavy machinery over the regular street car tracks through the business section of Hartford and over the river to East Hartford. Eighty-nine carloads, in all, were moved, of which fifty-nine carloads consisted entirely of heavy machinery. The lighter equipment was moved by truck—212 truckloads in all.

The work of moving was carried on during both day and night. In a single day eighty-five large machines were moved, some of which weighed over 5 tons.

While the actual moving took only five days, plans for transferring the equipment from one plant to another without suspending operations had been made months ahead. Overhead wires had been strung and tracks had been laid into the courtyard of the old plant, and three loading platforms had been equipped with cranes. At the new plant two spurs were provided for unloading the machinery as it arrived. Prior to moving, the entire floor area of the new plant—some 400,000 square feet in extent—had been laid out with spaces outlined for each machine. The spaces were numbered, and the machines were given corresponding numbers, so that on their arrival they could be moved promptly to their proper places by tractors.

One department was moved at a time. A complete blueprint of the floor plan was posted, and as the material was unloaded, the chart showed exactly where it was to be placed. Because of this procedure and the twenty-four-hour moving service, it was not necessary to shut down any department until the day that particular department was to be moved.

All machines had previously been converted to individual motor drive, and as soon as they were set down on the floor in the new plant a crew of 130 electricians quickly provided all the electrical connections. The next morning the department was ready to run. In all, 2100 tons of machines and 2000 tons of materials were moved.

One of the many previously planned facilities for accelerating the moving was a frame provided with block and tackle, as shown in the accompanying illustration. This frame rolled on casters and could easily be moved over any machine to lift it onto skids or trucks.

* * *

According to the National Automobile Chamber of Commerce, 18 per cent of the finished rolled steel and iron produced in the United States is used in the automotive industry. Furthermore, 60 per cent of all the strip steel, 39 per cent of the sheet steel, 29 per cent of steel manufactured in the form of bars, and 52 per cent of the malleable castings produced is purchased by automobile factories.

Multiple Hydraulic Cylinders for Slow-moving Machinery

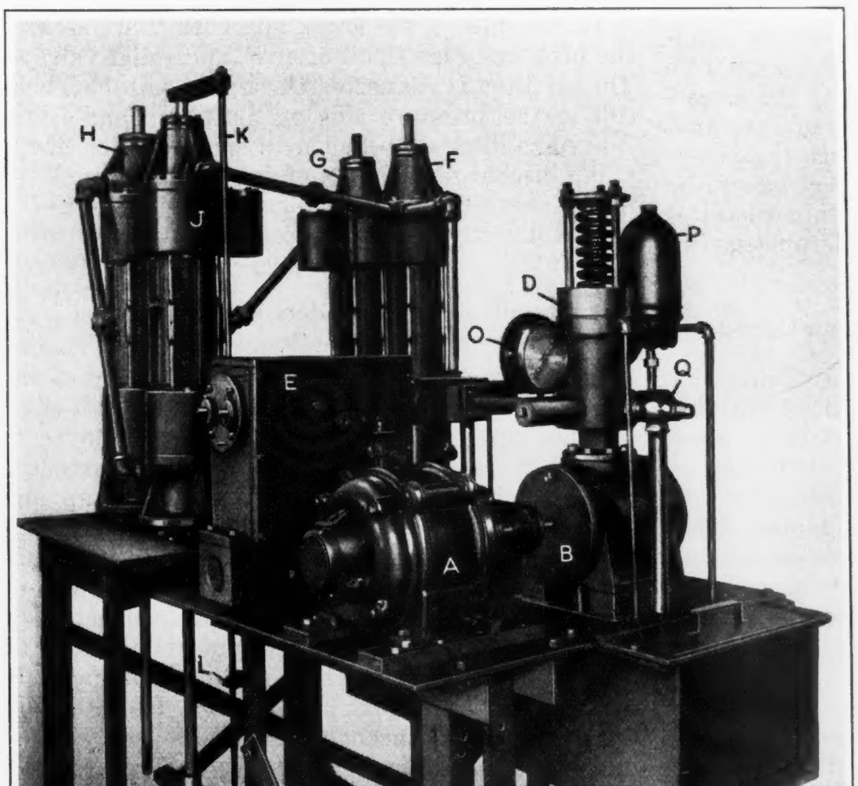
Obtaining a Reciprocating Movement for Large Units by Connecting Four Hydraulic Cylinders with an Oil-pressure Pump

By CHARLES B. IRMER

THE design of slow-moving machinery of a reciprocating type often presents a difficult problem. In most cases, the generally accepted practice is to use mechanical means for producing the required motion. Probably the mechanism most commonly employed for this purpose is the crank and connecting-rod. If the reciprocating motion is required to have a long stroke, the size of the crank, connecting-rod, and supporting structure necessary to resist the strains may be excessive. Also, if it is desired to operate the device with a standard motor, the problem of providing a suitable speed reducer arises and may be of considerable importance, at least from the viewpoint of initial cost.

It often happens that machines of large size having many reciprocating parts must be driven from several points. The mechanical coupling of all these drives to insure proper operation may be quite a problem. With machine drives of this kind, it is possible that one of the reciprocating parts may take a much greater instantaneous load than any of the other elements. Thus it is necessary that each driving member and its couplings be designed to withstand the full power of the driving motor. All these factors necessarily increase the physical proportions of the machine.

Experimental Set-up, Consisting of Four Hydraulic Cylinders, Oil-pressure Pump, Driving Motor, and Piston-synchronizing Valves for Reciprocating Large Units



Advantages of Hydraulically Operated Reciprocating Motion

The use of hydraulic cylinders for the operation of reciprocating machinery requiring a rather long stroke offers many advantages over the typical mechanical type of drive. A few of the more important advantages of the hydraulic type of drive may be summarized as follows:

1. The required reciprocating motion is applied directly without using speed reducers, cranks, connecting-rods, etc., thus eliminating the usual difficulties arising from wear on the mechanical parts.
2. The strains to be considered in designing are all direct, all angular thrusts of component driving members being eliminated.
3. The problem of lubricating moving parts is practically eliminated when oil is used as the operating medium within the cylinders.
4. The size and weight of the machine is reduced, generally resulting in lower cost.
5. The velocity of the reciprocating members is uniform, except at the extreme ends of the stroke.
6. By the use of a variable discharge pump, the speed of the machine can be readily varied from zero to maximum in accordance with the pump capacity.
7. The maximum strain to which the mechanism can be subjected under operating conditions can be readily regulated by inserting a suitable relief valve in the pump pressure line.
8. The absence of mechanical drive couplings between the component parts usually makes the

machine more accessible and thus facilitates maintenance and repair work.

Mechanical Reciprocating Mechanism Replaced by Hydraulic Equipment

In an electrolytic machine having a tank 50 feet long by 6 feet wide by 3 feet deep, there are eighteen banks of electrodes, each consisting of ninety plates spaced 3/8 inch apart. Between adjacent plates there is a scraper of insulating material which must be reciprocated or moved up and down continuously. In the original design, the scrapers were given the required reciprocating motion by walking beams, six of which were connected to a common rocker shaft. There were three rocker shafts on each machine, making a total of eighteen walking beams requiring three chain drives from a motor-driven countershaft. With this type of drive, any obstruction tending to resist the motion of the scrapers actuated by any one of the walking beams might result in the entire output of the motor being momentarily concentrated on that one beam.

Although this mechanical drive was in successful operation, experience indicated that it was highly desirable to decrease the number of working parts. The physical limitations of the walking beam drive also limited the stroke to 8 inches, making it necessary to employ a large number of small electrode plates to obtain the required capacity. In considering means for simplifying the machine, the advantages of applying a hydraulic drive became evident. With this type of drive, it would be possible to use much larger electrode plates and thus reduce the number required. In addition, the hydraulic cylinders could be so arranged on the top of the concrete tank that they would not interfere with the accessibility of the equipment from the top of the tank. This construction would also eliminate the necessity for excavating to a depth of 6 feet below the tank, which was required when using a mechanical drive—a feature resulting in a considerable saving in building costs.

Special Requirements Met by Using Four Cylinders

The conventional single-cylinder hydraulic installation does not lend itself to the type of machine described, because it would be necessary to place the cylinder directly over the center of the top of the electrodes, a feature that would necessitate its removal when renewing the electrode plates. This would also be a great disadvantage in cleaning the machine. As experience indicated that the scrapers were likely to be unequally loaded at times, the lifting rods for actuating the scrapers would have to be guided both inside and outside the tank if a single cylinder were used.

Finally, it became evident that the practical solution of the problem was to mount a hydraulic cylinder directly over each lifting rod, and have the operating mechanism so arranged that the pistons of all cylinders would be automatically synchronized in their movements, irrespective of any variations in their loading. A system of this kind was finally evolved after much experimentation, which consisted of four cylinders, connected in series with suitable valves which were provided as integral parts of the system.

A mechanically operated valve was developed for reversing the motion of the pistons at the end of the stroke. Incorporated in this valve mechanism was a cam motion for producing a smooth reversal and shock absorption on the pressure side of the line.

The general arrangement of the equipment, as set up in the shop for testing purposes, is shown in the accompanying illustration. The motor *A* drives the pump *B*, which forces oil from the sump *C* through the shock absorber *D* to the valve and reversing mechanism *E*. From the valve the oil passes to the cylinders *F*, *G*, *H*, and *J*, which are connected in series as shown, the oil from one cylinder being forced into the next one in regular sequence. The discharge from the trailing cylinder at each reversal of motion is returned through the valve and reversing mechanism to the oil sump. At the opposite ends of each cylinder are self-contained valve mechanisms. These valves operate at each end of the piston stroke in such a manner as to keep the movements of all four pistons properly synchronized.

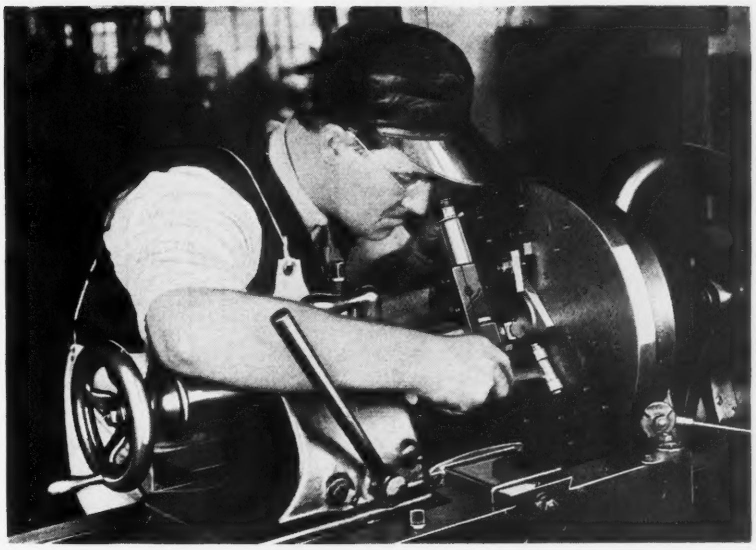
On the piston-rod of the cylinder *J* is secured the rod *K*, which carries two reversing stops, one of which is shown at *L*. These stops make contact with the reversing arm of the valve mechanism *E* and reverse the direction of piston travel in the four cylinders at the end of each stroke.

To the sides of the shock absorber *D* are secured the pressure gage *O*, oil filter *P*, and relief valve *Q*. The oil filter is connected through a suitable choke coil to the pressure side of the pump and is arranged to filter continuously a small portion of the pump discharge. The relief valve is also connected to the pump discharge and causes the oil to be by-passed directly to the sump in case the operating load on the pistons becomes greater than desired.

Installation of Cylinders and Controlling Mechanism on Electrolytic Machine

In the actual installation of the equipment on the electrolytic machine, the cylinders are spaced some distance apart. A counterweight is employed to balance the dead weight of the moving parts and thus equalize the pump pressure on the up and down strokes of the machine. In the actual installation the reversing stops are secured to the counterweight lifting rod. The scraping mechanism of the machine previously described is connected directly to the piston-rods of the four cylinders. For a given capacity, a machine of this type has only one-quarter as many parts when hydraulically driven as when a mechanical drive is used. While in the present design but four cylinders are used in series operation, the writer believes a larger number of cylinders could be used with equally good results if the synchronizing valve system were properly designed.

Toolmakers' Cross-Line Microscopes



Description of an Inexpensive Cross-line Microscope for General Shop Use, and a More Elaborate Instrument for Centering Lathe Work

By KEN G. NIBLACK

THE advantage of centering lathe work with a cross-hair microscope and the construction of a microscope for this purpose were described in January MACHINERY, page 358. As the construction of a complete cross-hair microscope such as that described necessarily involves considerable painstaking work and expense, it may be of interest to note here that a similar cross-line microscope can be purchased from the Bausch & Lomb Optical Co., Rochester, N. Y., for less than $20. The principal dimensions and arrangement of the lenses of this complete instrument, together with prices of the important units, are given in Fig. 1.

Assembling a Simple Cross-line Microscope

Any machinist who desires to do so, can easily make an instrument such as shown in Fig. 1 by purchasing the 48-millimeter objective for $5, the 5X eye-piece for $2.75, and a mounted cross-line disk for $3. The cross-line disk can easily be mounted in the eye-piece. All that is required, then, is to purchase a piece of tubing and solder a threaded ring in one end for the objective piece. The distance between the eye-piece cap and the shoulder of the objective is 160 millimeters. With this type of microscope, the cross-line is always in focus. The cross-line disk can be used unmounted if the microscope is always held in a vertical position, and an unmounted cross-line disk, accurately ruled by a diamond point, costs only $2.

All types of disks having cross-lines, scales in inches or millimeters, different angles, broken lines, etc., are made up by optical manufacturers on special machines that do this ruling very cheaply and efficiently. Microscopes having such disks have long been used for indexing, positioning tools for milling, and centering work for boring and other operations.

Microscope with Inverting System

The heading illustration shows a cross-line microscope being used to center a piece of work on a lathe faceplate. This instrument was made by the Bausch & Lomb Optical Co., and has been in use in their shop for about four years. It has proved a very convenient and effective device. The optical system of this instrument is far too complicated for the average machinist to construct, due primarily to the fact that it has an inverting system in the eye-piece that makes the work appear to move in the natural direction, and not inverted or reversed as in the regular laboratory instrument.

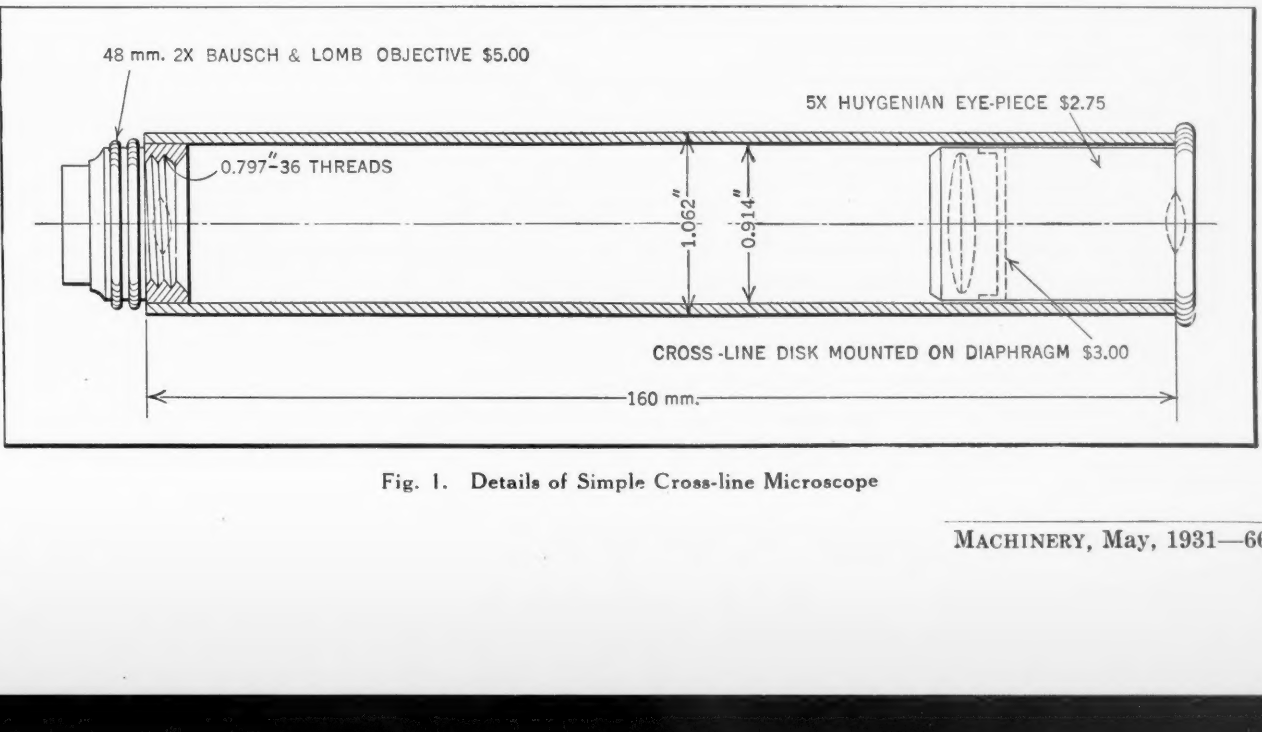


Fig. 1. Details of Simple Cross-line Microscope

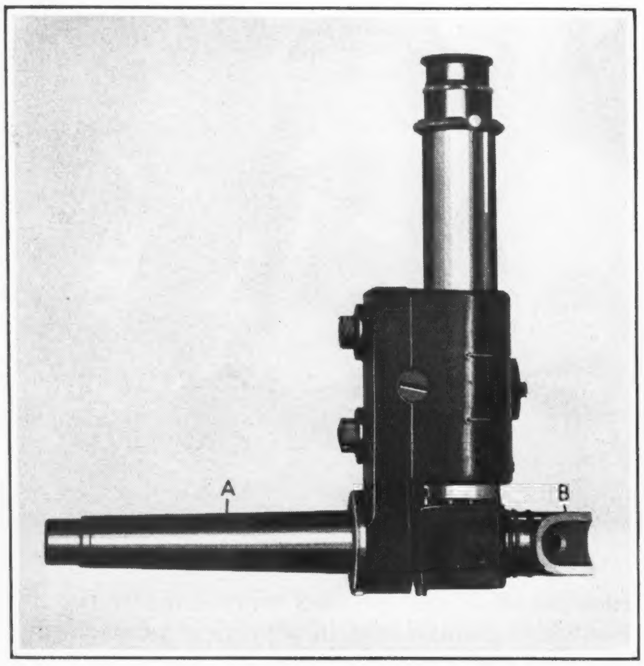


Fig. 2. Cross-line Microscope for Centering Work on Lathe Faceplate

With the instrument shown in the heading illustration, the operator can assume a comfortable position when centering a piece of work such as shown. The instrument has a shank *A*, as shown in Fig. 2, which fits the tailstock center of the lathe. This brings the intersecting point of the cross-lines in close alignment with the center line of the lathe spindle. The work is placed on the faceplate of the lathe after two intersecting lines have been scribed to locate the exact position of the hole to be bored.

The tailstock spindle is then moved up toward the faceplate until the microscope is in focus. Focussing is greatly simplified by the piece *B*, which extends ahead of the prism or objective. The tailstock spindle is simply moved forward until the end of piece *B* touches the work. Backing the instrument away by a quarter turn of the tailstock spindle then brings the microscope into perfect focus.

Now, when the work is revolved, the intersection of the cross-lines on the work will be seen to remain at one point if the work is central, and if not, the point of intersection of the lines in the work will move in a circle. The work should be adjusted until the intersection point stays in one position. From this explanation, it is obvious that it is not necessary to have the cross-lines in the microscope absolutely centered in order to make a quick and accurate setting of the work, as they are needed only for reference in watching the intersection of the lines in the work as the work is revolved.

Optical System of Inverting Type Microscope

In the diagram Fig. 3, the dotted lines in the view at the right show the way a vertical image is carried through the optical system, how it is inverted by the 90-degree reflecting prism and then corrected by the objective, so that it is correct as we see it when looking through the eye-piece at the focal plane—that is, the plane on which the cross-line disk is mounted.

The end view at the left, Fig. 3, shows the horizontal position of the object and how it is reflected from the right-angle prism without being inverted. In order to correct this, a "dove" prism is placed in the tube, so that the left end of the object will come out at the right-hand side of the objective. The objective, inverting it, then brings it right for our eyes. The result is that we will see the object in the correct position, and not inverted or reversed.

Whenever a right-angle prism is used, some means should be found for completing the correction, for it is confusing to see an object with the right and left sides reversed, when it appears correct as far as the top and bottom are concerned.

* * *

As measured by the wholesale value of the finished product, the automobile industry ranks first among America's manufacturing industries. It reached this position in 1923, and still holds it.

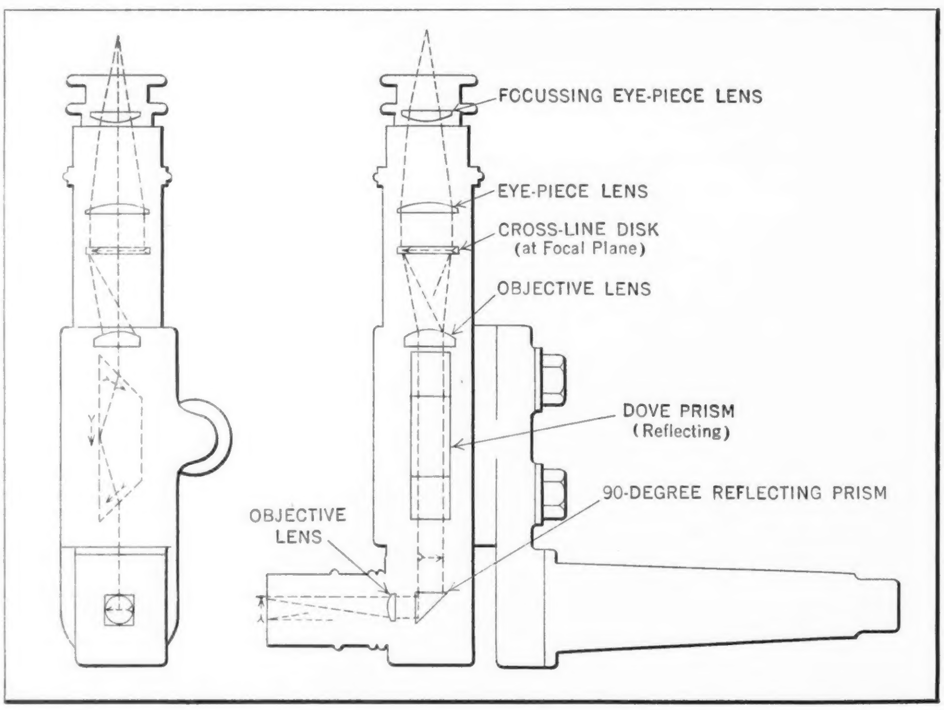


Fig. 3. Diagram Showing Elaborate Optical System of Instrument Shown in Fig. 2

Typical Master Plate Design

By ROY E. BENDER

IN cases where holes in a number of similar parts are to be spaced with extreme accuracy, and must at the same time be square with the part, an accurate drill jig will not always suffice. One reason for this is that the drill press platen may not be exactly square with the spindle; and again, drills and reamers sometimes "crawl" slightly, even though they are guided by accurate bushings. The desired accuracy, however, may be obtained by means of a device called a "master plate."

There are many varieties of master plates, and to illustrate their principle of design and operation, we may consider the work shown at *A* in the illustration. This part is finished on both sides by surface grinding, and contains seven large holes which must be spaced with great precision. The two small holes *K* are for dowels that locate the work on the master plate. These dowel-holes are drilled and reamed in the work by means of a simple templet jig.

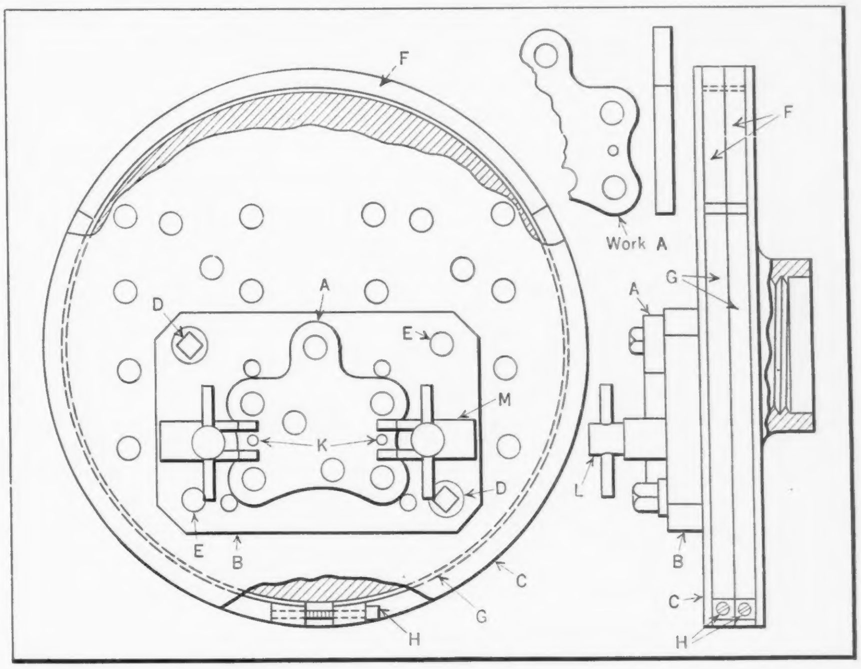
At *B* is shown the master plate, and at *C* a specially constructed lathe faceplate on which the master plate is mounted. The latter is clamped to the faceplate by the screws *D*, and is accurately located by the dowels *E* secured in the master plate. These dowels are a close slip fit in corresponding holes in the faceplate. To locate each of the seven holes in the work successively, fourteen screw-holes and a like number of dowel-holes are provided in the faceplate. The accuracy of the spacing depends, of course, on the location of these dowel-pin holes.

The work and faceplate are counterbalanced by the two weights *F*. This arrangement is necessary, as the master plate is located off center while the holes are being bored in the work. The weights are mounted on the steel bands *G* which are clamped to the faceplate by the screws *H*. Both weights may be rotated independently around their groove, providing very accurate balancing. For comparatively small master plates, however, balancing weights are not always used.

The master plate is made of steel, and its two sides are ground as nearly parallel as possible. The work is secured to this plate by the straps *M* and the clamping screws *L*. In laying out this plate, two of its adjacent edges are ground square with each other and square with the sides. This is essential, because the edges are used for locating toolmakers' buttons in order to obtain the correct spacing between the holes.

In using the master plate, let it be assumed that 100 pieces like the one shown at *A* are required. The plate is set in position for finishing one hole, and this hole is finished in each of the 100 pieces. The master plate is then relocated and another hole finished in each of the pieces. This process is continued until all the holes are finished.

In operation, the usual procedure is to mount a drill chuck in the lathe tailstock. Then the work is spotted with a combination drill and countersink held in this chuck and the hole drilled, say, 3/64 inch under size. One or two cuts are now taken with a boring tool in order to true up the hole, after which the hole is reamed to the desired size.



Type of Master Plate Employed for Production Boring Requiring Great Accuracy

* * *

It is encouraging to note that the exports of metal-working machinery from the United States during February, the last month for which complete statistics are available, surpassed the totals both for the two previous months and for the month of February a year ago. The exports of metal-working machinery were valued at $3,928,000 in February, 1931, as compared with $3,074,000 in January this year, and $3,310,000 in February a year ago. Exports of industrial machinery as a whole, however, did not show a corresponding increase, but fell below the January figures.

EDITORIAL COMMENT

A prominent tool manufacturer stated recently that his sales engineers, all of whom are men of thorough shop experience, frequently found it difficult to enlist the interest of foremen in suggestions for improving manufacturing methods. "Many foremen," he said, "because of their long experience, believe they know better than anyone else how the work should be done. They consider it a reflection on their ability if anybody suggests that the methods in use in their department are not the most efficient."

The Progressive Foreman Welcomes New Ideas

Doubtless, this is true of many foremen; but unfortunately, it is also true of men in every walk of life. There are always men who resent new and better ways, because they believe all that is worth while has been covered by their own experience. But we have all observed that truly successful men are never of this type: they are always ready to listen to suggestions and try out new methods. Hence it is that the progressive foremen who are always on the alert and ever ready to adopt the latest worthwhile developments in machines and tools are the ones who rise and become superintendents and works managers. We believe that among the younger men, particularly, these men constitute a vast majority. They recognize that there is too much to be known about machine shop work for any one man to know it all, and they are always ready to listen to helpful suggestions.

Whose Fault Is It When a Man Is Not Promoted?

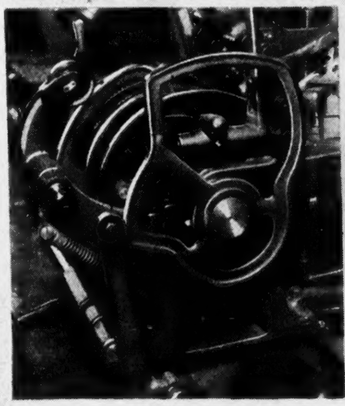
The editor of a technical journal is frequently asked to advise his readers not only on technical and engineering subjects, but also on the possibilities of business ventures in the mechanical field, on the best way to sell patents and to promote companies for their production, and on many similar subjects. Perhaps the largest number of letters asking for advice come from men who feel that they have been slighted when there was an opportunity for promotion. They feel that other men with less knowledge or skill have been advanced to positions that should have been offered to them.

It is difficult to form an accurate idea of the factors involved from a letter. Undoubtedly there are cases when men having the qualifications for promotion are overlooked. The ability of men outside an organization is often overestimated, while the shortcomings of those who are seen daily at close range are likely to be magnified. But it is probable that the correspondent is lacking in some of the personal characteristics required for the advanced position. Mere technical skill or engineering knowledge is not all that is necessary to fill a higher position. The ability to cooperate with other men, to train and develop understudies, to deal effectively with customers, and to "get along" with people generally may be important considerations. Many highly trained engineering specialists lack some of these qualities. The man who feels that he has been passed by might well ask himself whether he is deficient in any of these qualifications. This may help him to remedy some shortcoming and pave the way for his advancement in the future.

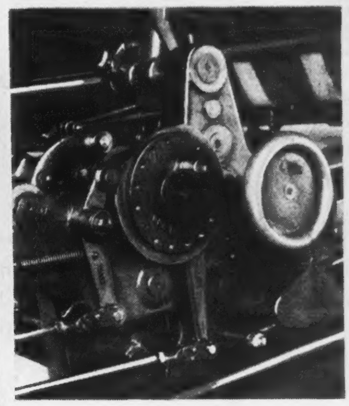
When to Save and When not to Save is the Question

Most remarkable results have been obtained by encouraging foremen to watch the tool costs in their departments. If the foreman instructs the machine operators properly, much waste from breakage of tools may be avoided; and even when the tools do not break, they may be made to last longer if the operators are thoroughly instructed in their use. Tools that are no longer required for one job can often be transferred to another, with or without slight alterations. In that way, the cost of new tools may be saved. One automobile concern, by encouraging the foremen to watch tool costs, has reduced the tool expense per car to 40 per cent of what it was three years ago.

The effort to save in the cost of tools can, of course, be carried to an extreme. The production cost records must be scrutinized closely to make sure that the total costs per piece produced are not increased by the effort to save in the cost of tools. In the automobile industry, such false economy is not likely to be exercised, because production costs are watched carefully. In some other branches of the machine shop industry, however, there might be a tendency to let the immediate saving in tools overshadow the more important matter—actual production cost. There are some plants in which it would be wiser to spend more for good tools than is done at present. In many a shop, the production that good machine tools are capable of is seriously reduced by the use of inferior tools. Whether or not tool costs can be reduced without interfering with output is a matter of judgment and cost accounting.



Ingenious Mechanical Movements



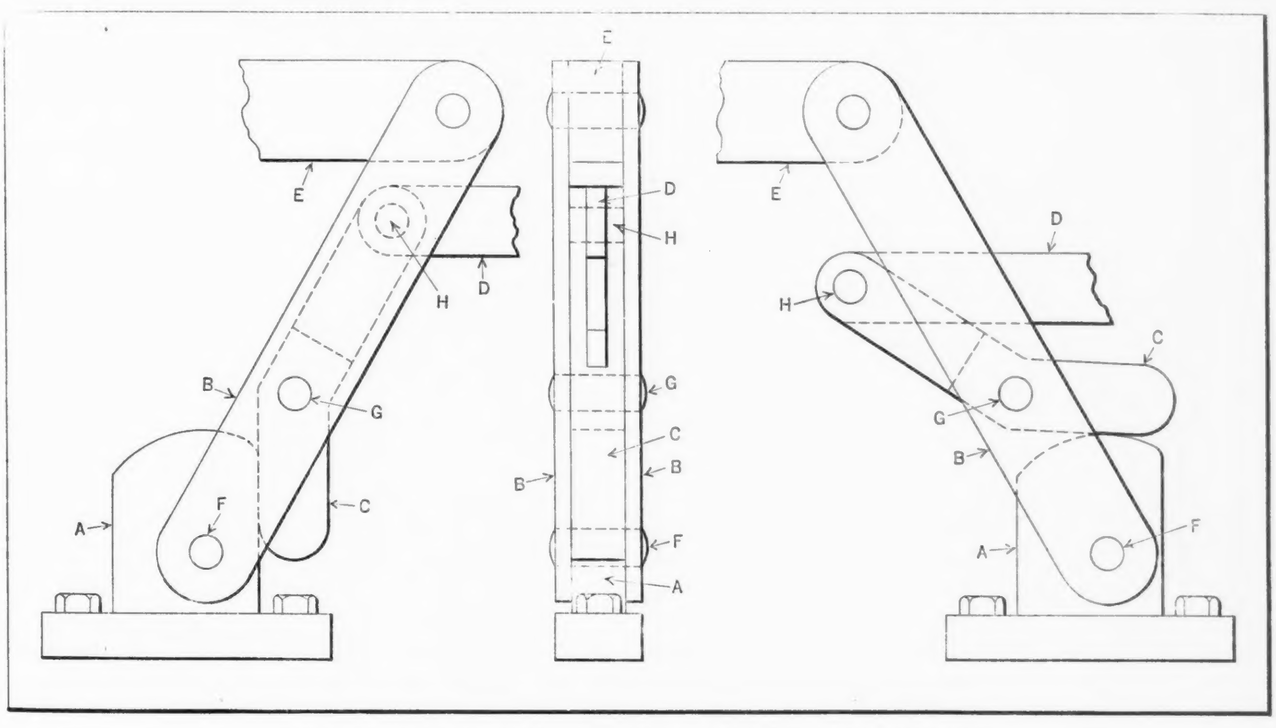
Quick-acting Brake Movement

By R. H. KASPER

The accompanying illustration shows the construction of a mechanism designed to provide more than the customary amount of clearance for a brake-shoe without sacrificing any of the braking properties. This is accomplished by a system of levers that provide for a quick take-up of the clearance space, after which the brake movement is effected in the usual manner.

Part *A* is fastened to the stationary part of the machine and carries the pin *F* on which the double levers *B* pivot. The upper surface of part *A* is machined to conform with the arc of a circle of which pin *F* is the center. It will be noted that the pin *F* is located off center in part *A* and that the upper edge of part *A* terminates in a small arc-shaped surface on the right-hand end. Levers *B* carry between them lever *C* which fulcrums on the pin *G* and carries at its upper end the bar *D* attached to it by the pin *H*. The opposite end of bar *D* is attached to the brake-shoe.

The side view at the left and the end view at the center show the arrangement with the brake-shoe in the released position. As the bar *E* is moved to the left, lever *B* fulcrums on pin *F*, and the upper right-hand corner of part *A* acts on lever *C*, which is caused to fulcrum on pin *G*. As the movement of the lower end of lever *C* is multiplied at the upper end, bar *D* is drawn forward quite rapidly in advance of levers *B*, thus quickly reducing the clearance space between the brake-shoe and the drum. As soon as the lower end of lever *C* has passed over the corner of part *A*, lever *C* ceases to act independently, and moves in unison with levers *B*.



Quick-acting Cam-and-lever Mechanism for Operating Brake-shoe

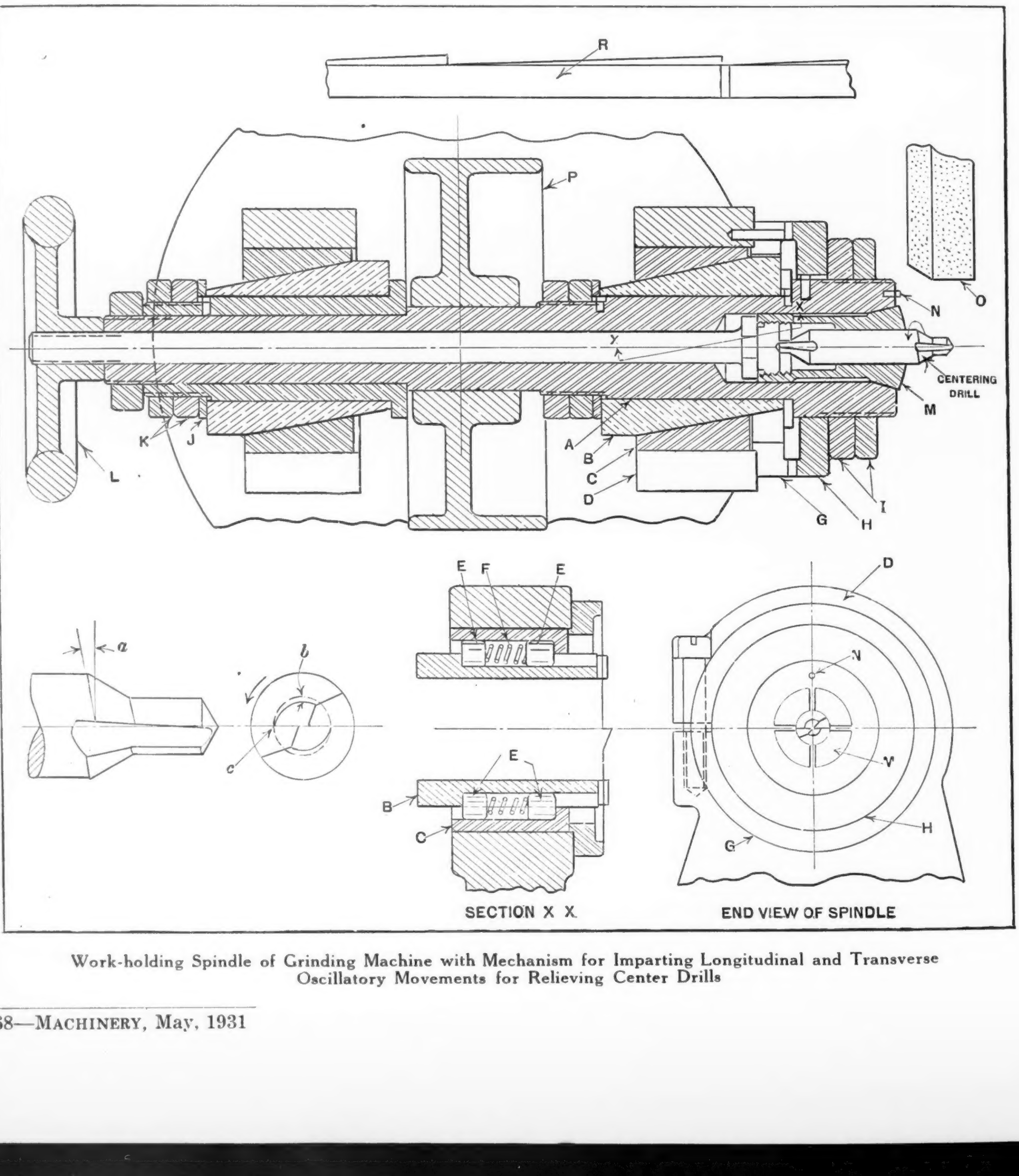
Relieving Mechanism for Grinding Centering Drills

By N. P. DARASH

A mechanism designed to give the work-holding spindle of a Brown & Sharpe grinding machine the movements required to relieve a center drill properly is shown in the accompanying illustration. With this mechanism and a wheel dressed as shown at *O*, centering drills can be automatically relieved as indicated at *a* and *b* by the diagram in the lower left-hand corner of the illustration. The centering drill to be ground is held in the collet chuck *M* operated by the handwheel *L*.

The spindle *A* is driven by a belt running loosely over the pulley *P*, and revolves continuously during the grinding operation. The centering drill is always located in the chuck with the flutes or cutting edges in the same position relative to the pin *N* in the end of the spindle *A*. This is accomplished by means of a simple locating plug. After chucking the work, the grinding wheel is brought into the operating position.

As the spindle *A* revolves, it is given an endwise oscillating movement in conjunction with a cross movement. Assuming that the cutting edge of the drill indicated in the diagram at *c* is in contact with the grinding wheel, the continued rotation of the drill spindle causes the work to advance longitudinally toward the wheel on a line parallel with the spindle of the grinding wheel, and also to advance inward toward the cylindrical and conical face of the grinding wheel. The movement of the work toward the cylindrical face of the grinding wheel results in grinding the clearance indicated at *b*. This movement, in conjunction with the longitudinal movement, results in producing the clearance indicated at *a*. On completing the grinding of one cutting lip, the spindle returns to the starting position and the same movements are repeated for grinding the other cutting lip of the drill.



Work-holding Spindle of Grinding Machine with Mechanism for Imparting Longitudinal and Transverse Oscillatory Movements for Relieving Center Drills

The mechanism that produces the combined longitudinal and transverse movements of the spindle *A* consists of a cam *G* secured to the housing of the spindle bearing, a mating cam *H*, securely fastened to the spindle *A*, and the angular spindle-supporting bearing composed of members *B* and *C*. A development of a portion of the cam *H* is shown at *R*. This cam is made with the proper amount of lead and with as many "rises" as there are lips to be ground. In this case there are, of course, two "rises." The hole in the member *C* is round, but is drilled at an angle with the center line of the spindle. Member *B* is a close sliding fit in this bearing and is prevented from revolving within member *C* by the cylindrical keys shown at *E* in section *X–X*. The springs *F* serve to keep the cam *H* in contact with the cam *G*. The bearing *C* is machined on the outside to fit into the bearing housing of the regular universal head *D* of the grinding machine. The proper tension in the springs *F* is obtained by adjusting the nuts *I*. The nuts *K* can be adjusted to take up the thrust of washer *J*.

It may be of interest to note that an automatic loading device is now employed with the mechanism described, which makes the complete assembly fully automatic in operation. The production time with this equipment is twelve ends or six complete centering drills per minute.

* * *

Rapid Indexing Turret

By H. C. TOWN

Only two movements of a lever are necessary to index and clamp the boring mill turret shown in Fig. 1. By swinging the lever *A* through an angle of 118 degrees, the turret is unclamped, unlocked, and revolved to the required station. When the lever is returned to its previous position again, the turret is locked and clamped securely to the slide *C*.

The working position of each station of the turret is located accurately by means of the spring plunger *D*, which engages one of the six equally

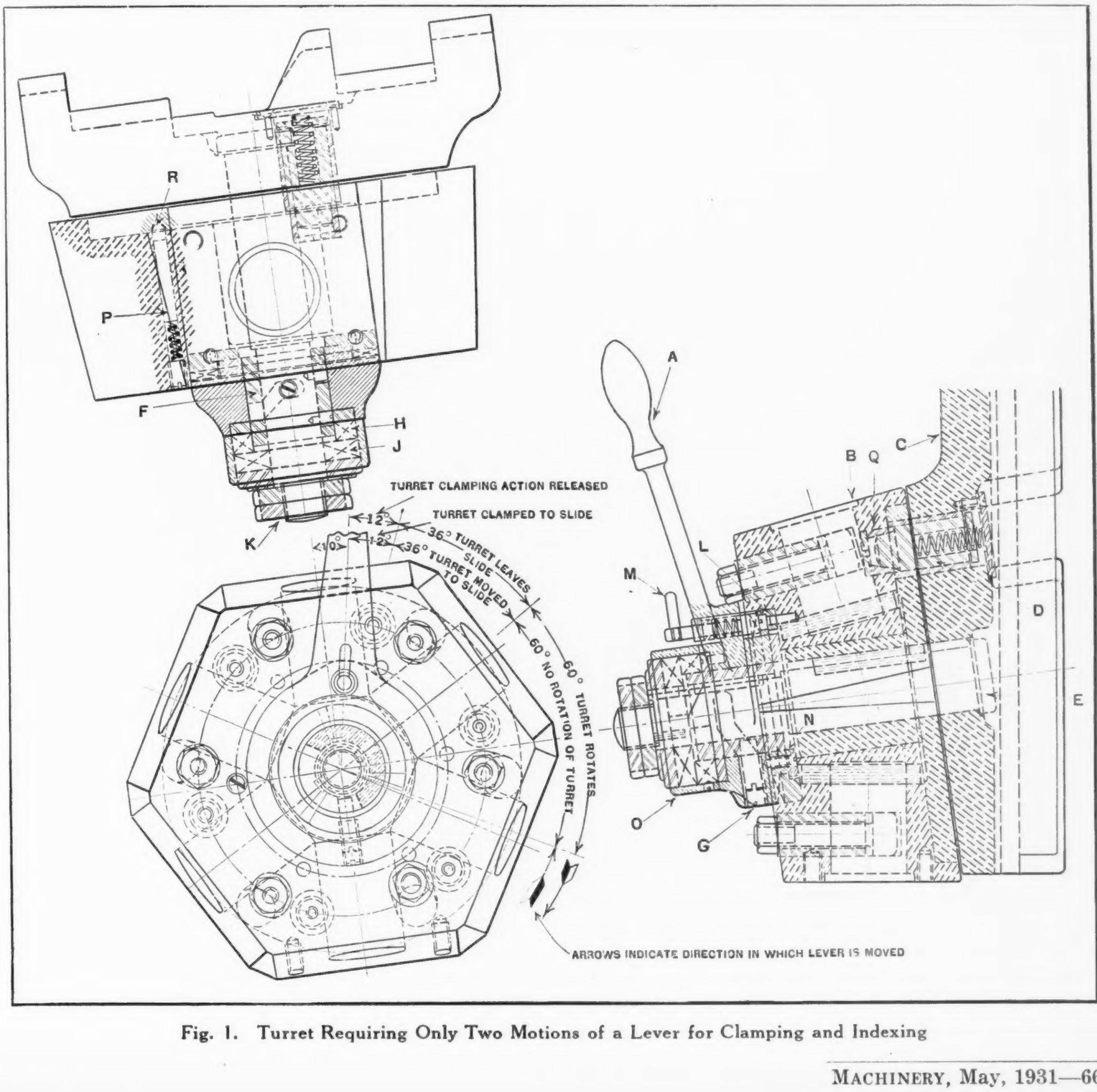


Fig. 1. Turret Requiring Only Two Motions of a Lever for Clamping and Indexing

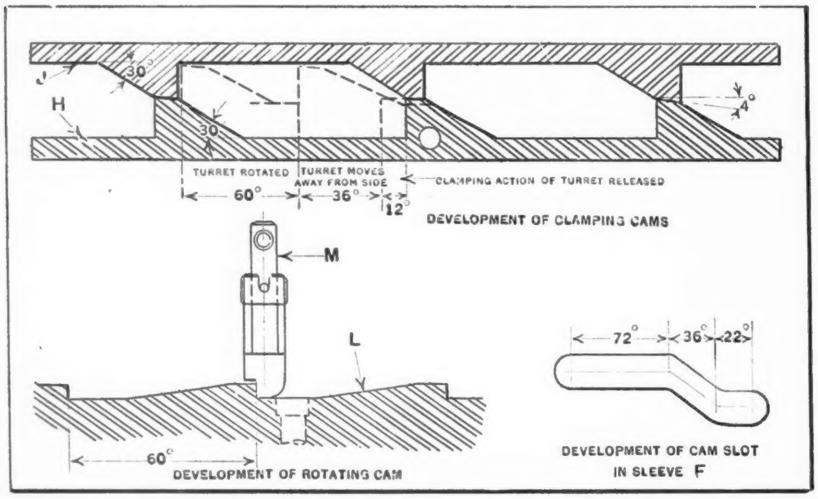


Fig. 2. Development of Cams Used in Turret Shown in Fig. 1

spaced bushings *Q*. The center bolt *E* is a press fit in and keyed to the slide *C;* sleeve *F*, in which is milled a cam-shaped slot, is keyed and pinned to bolt *E*. The development of this cam slot is shown in the enlarged detail in Fig. 2.

The hub bore of lever *A*, Fig. 1, is a slip fit on sleeve *F*. The end of the screw *G* in the lever engages the cam slot in the sleeve. The clamping face-cam *H* is fastened to the under side of the lever hub and engages a cam *J* keyed to the center bolt. Adjacent to cam *J* is a washer backed up by two lock-nuts *K* for adjusting the clamping pressure of the turret.

Another cam *L* is fixed to the turret and engages the spring plunger *M*. This plunger can be pulled out of engagement with the cam and locked in this position in case more than one station is to be indexed. The retaining ring *N* for the cam *J* is fastened by screws to the operating lever. The cover *O* is fastened to the cam *H* and is a slip fit over cam *J*.

When the turret is clamped in position, lever *A* will be inclined 10 degrees from the center line of slide *C*. The enlarged development of the clamping cams (see Fig. 2) shows their positions when the turret is clamped. The movements of these cams between varying positions of the operating lever are indicated by dotted lines. Moving the lever in a clockwise direction through an angle of 12 degrees causes cam *H* to slide to the left and release the clamping pressure on the turret.

A further clockwise movement of the lever through an angle of 36 degrees will cause the end of screw *G*, Fig. 1, to slide up in the cam slot in member *F*, resulting in a movement of the turret away from slide *C*. This movement is sufficient to allow the end plunger *D* to clear the bottom of the turret. The end of plunger *M* has now moved into contact with the projections on the rotating cam, as shown in Fig. 2, and as the lever continues through an angle of 60 degrees, the turret is rotated to the next station.

The lever is now moved back to its original position. During this reversal, the movements described, except the rotating motion of the turret, are performed in the reverse order. The turret is prevented from rotating by the projections on cam *L* which allow plunger *M* to rotate the turret in one direction only.

To enable the operator to determine instantly when the indexing plunger is opposite one of the bushings *Q*, Fig. 1, an auxiliary plunger *P* is provided. This plunger is always in contact with the turret slide when indexing and enters one of the six equally spaced depressions *R* when the main indexing plunger *D* is in line with one of the bushings *Q*.

Hardening Metals by Rotating Magnetic Fields

In a paper recently presented before the Royal Society of Great Britain, Edward G. Herbert of Manchester, England, describes a new method by means of which the hardness of metals may be increased by the action of a rotating magnetic field. A feature of this invention, which is covered by patents, is the fact that the process has the same effect on metals usually regarded as non-magnetic, such as brass and duralumin, that it has on steel.

The invention has practical applications of considerable importance. Articles made from hard steel can be greatly increased in hardness through this method, and this increase in hardness is found to remain even when the objects are subjected to high temperatures. It is believed that the phenomena are atomic in character, and that this discovery may lead to an extension of our knowledge in the realm of atomic physics.

The present discovery may be said to have been started with Mr. Herbert's earlier discovery that the hardest steel could be superhardened by rolling it with a spherical diamond, and that hard steel parts of automobiles are superhardened by the severe abrasion that occurs in service. This led to the invention of the "cloudburst" method of superhardening steel by bombarding it with hard steel balls; to the discovery that superhardened steel undergoes a further spontaneous hardening during several hours after the cloudburst; and to the invention of the magnetic process of rotating polarity to enhance this spontaneous increase of hardness. The discovery that the rotating magnetic field does not simply harden, but causes a sequence of hardness changes with time, led to its application to a variety of steels, both hard and soft, and to non-magnetic metals. Further developments are likely.

How Glue Affects Polishing Costs

Determining the Efficiency of Present Practice in Setting up Polishing Wheels—How to Reduce Costs by Applying Improved Methods

By ROBERT T. KENT, Director of Engineering, Divine Bros. Co., Utica, N. Y.

THE principal expenses in the polishing room are for labor, abrasive grain, glue, power, and polishing wheels, the biggest factor being the labor cost. The life of polishing-wheel heads affects the costs for labor, abrasive grain, glue, and power. Short wheel-head life means an excessive amount of lost time in changing wheels and lower production. It may also necessitate an advance in piece rates in order to enable the men to make living wages. Lower production and higher piece rates, of course, increase the cost of the work.

Short life also means that the abrasive grain is being torn from the wheels before it has been used up in cutting metal. This is wasteful and increases the expense for abrasives. Again, short wheel-head life involves setting the wheels up more frequently, thus increasing the expenditure for abrasives, glue, and labor.

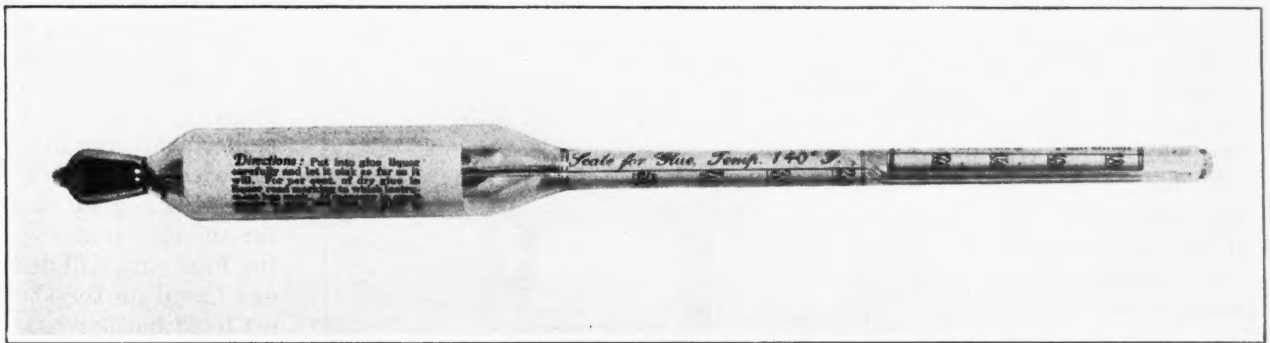


Fig. 1. "Glueometer" Graduated to Show Percentage of Dry Glue in Solution

How Much Does Inefficient Wheel Handling Cost the Manufacturer?

Any manufacturer can figure out for himself how much the use of incorrect methods of setting up polishing wheels actually costs him. To do this, it is only necessary to compare the life of his wheels with those that are set up under proper conditions. In the example that follows, it has been necessary to make certain assumptions. They are all well within the possibilities of manufacturing operations, but, of course, will not hold true for all cases. The interested manufacturer will naturally use data on wheel-head life, production, and wage rates that apply to his particular case. The data required and the procedure are as follows:

Ascertain how long a wheel lasts on a given job; how long it takes to change wheels; what the annual bill is for abrasive grain and glue; and how long it takes to set up a wheel. Assume that it is possible to double the life of the head—there are cases on record where the life has been increased fivefold—by improved methods of handling glue and setting up wheels. The saving in dollars and cents made possible by improved methods of wheel heading can then be estimated or computed.

Assume that the polisher receives 75 cents an hour, and that his normal production rate is 60 pieces per hour. Assume that his wheel lasts half an hour, and that it takes 2 minutes to change a wheel. The loss in wages for changing wheels is 5 cents per hour, or 40 cents per 8-hour day. Assume that the setting up of a wheel with two heads requires 3 minutes, and that the set-up man receives 60 cents per hour. Then the wage cost of setting up the two wheels per hour worn out by the polisher is 6 cents.

The cost of abrasive and glue for a 16-inch by 3-inch wheel, set up with No. 120 grain, will average 2 1/2 cents, making a material cost of 5 cents per hour for the two wheels, or a total wage and material cost of 16 cents per hour for the two wheels, or $1.28 per day.

If the polisher sets up his own wheels, the cost will be 17 1/2 cents per hour, or $1.40 per day

Table Showing Proportions of Glue and Water for Setting Up Polishing Wheels

Size of Abrasive Grain	Percentage of Dry Glue	Pounds of Water per Pound of Glue	Quarts of Water per Pound of Glue
36	45	1.22	0.59
46	40	1.50	0.72
60	35	1.86	0.90
90	33	2.30	0.98
120	30	2.00	1.00
150	25	3.00	1.40

of 8 hours. If the life of the wheel-head is doubled, these costs will be cut in half, and the saving will be 64 cents and 70 cents per polisher, respectively. In addition, there will be saved the profit on the lost production during the time required for changing wheels and the absorption of shop overhead during one wheel-changing period. On this basis, a saving in labor and material alone of from $1 to $1.25 per day per polisher probably could be shown merely by doubling the life of the wheel-head. In a polishing room employing only ten polishers, this would amount to from $3000 to $4000 per year.

There are other intangible, but nevertheless real, savings that result from increasing the life of the wheel-head. A short-lived head is an inefficient one. Short life is an indication that the grain is being torn from the wheel instead of performing its proper cutting function. This means that the polishing time per piece, and hence the cost per piece, is being increased. The increase in production resulting from increased wheel life would possibly add from $1000 to $2000 per year to the figures already given. Obviously, the total saving in a room of ten polishers is a substantial amount.

How can the life of the wheel-head be doubled? The answer is simple. Select the proper glue and handle it properly. Polishing glue must have certain characteristics: (1) It must be strong; (2) it must be flexible; (3) it must be resistant to heat; (4) it must be made from hides that give it the foregoing characteristics; (5) it must be first-run glue; and (6) it must be uniform.

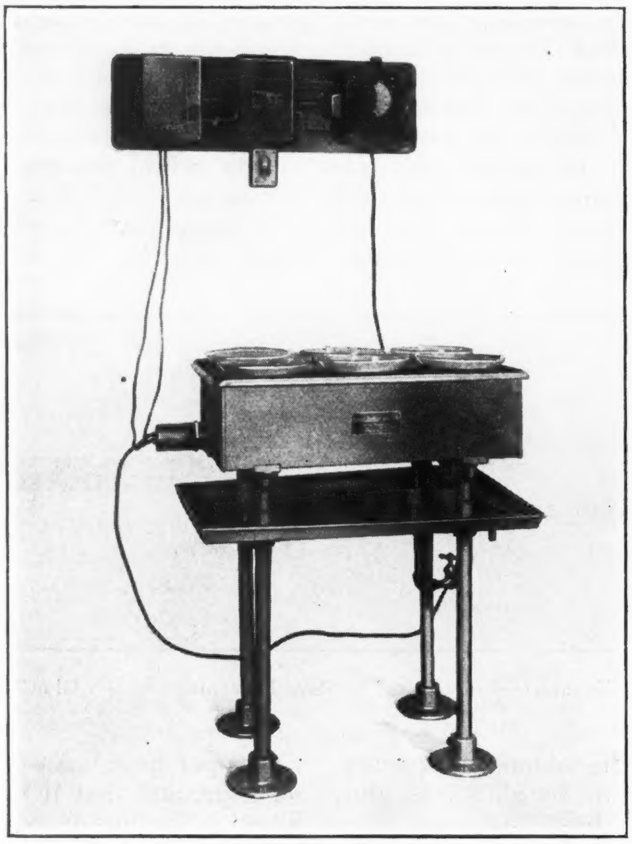


Fig. 2. Thermostatically Controlled Electric Glue Heater which Holds Temperature Constant within Limits of 2 Degrees F.

Characteristics of Glue

Hide glue is used almost universally for polishing in the United States, but not all hide glues are suitable for this purpose. Certain hide glues are brittle, and therefore will not stand the flexing action necessary in a polishing wheel. Instead of flexing, the glue will break in small sections when subjected to the strain set up by a polishing wheel in contact with the work.

These sections form small independent polishing units that are not so effective in action as the continuous surface on the wheel that would be provided by a more flexible glue, especially on wheels set up with the finer grains. Furthermore, these small sections are easily torn from the wheel, rendering it still more ineffective and contributing to its rapid destruction. It is poor economy to buy glue for polishing on a price basis.

First-run glue is always the strongest and best. It is also the highest priced. First-run glue is stronger than second-run or third-run glue. Hence, the price is some indication of the quality. Resistance to heat is a most important quality in polishing glue. The friction of the wheel on the work generates large quantities of heat. Heat tends to soften the glue and decrease its holding power. Hence, the less the tendency of the glue to soften under the heat generated in polishing, the longer will be the life of the wheel and the greater its efficiency.

Uniformity is important. If the glue varies in quality from lot to lot, the life of the heads set up with the successive lots will vary, with consequent variation in the cost of production. Such variation, too, precludes the setting of piece rates that will insure low labor costs, for the rate that will be the final rate will be the one based on the shortest lived heads.

How the Glue Should be Handled

Proper handling of glue involves a definite procedure. Neglect of any step in the process may make observance of all the others futile. The correct procedure is as follows: (1) Use only distilled water in preparing the glue. (2) Soak the glue for three hours in cold water; if the glue is ground, this time can be reduced to two hours. (3) Use the correct quantity of water to obtain the proper viscosity for the size of grain that is to be glued to the wheels. (4) Melt the glue at a temperature not exceeding 140 degrees F. (5) Prepare the glue in such quantities that it will be entirely used up in not more than four hours. (6) Have all glue pots and utensils for handling glue thoroughly clean. (7) Avoid mixing any old glue with the fresh glue. (8) Heat the polishing wheel to 110 degrees F. before applying the glue to it. (9) Heat the abrasive grain to 110 to 120 degrees F. before rolling the glued wheel in it. (10) Dry the wheels for forty-eight hours at room

temperature (not over 72 degrees F.) before use. (11) Maintain the relative humidity between 50 and 55.

The use of distilled water is advocated because raw water may contain substances that are injurious to glue. Lime in the water is especially harmful. If no distilled water is available, a still can easily be constructed, and its cost of operation will be repaid many times over in increased glue efficiency.

Glue should be soaked in cold water until it has absorbed all the water it will hold. Different glues will absorb different amounts of water, and the time required for completely soaking each glue varies. If the glue does not take up all the water it will hold, its full strength will not be developed. Hence, soaking is essential. It is better to soak the glue longer rather than shorter than three hours, provided the temperature of the water does not exceed 65 degrees F.

Quantity of Water Required in Glue

The quantity of water that should be used varies with the size of the abrasive that is to be glued to the polishing wheel. The larger sizes of abrasive grains require a thicker glue than the finer grains. The accompanying table shows the percentage of dry glue required in the liquid glue for various sizes of abrasive, as determined in the laboratory.

It is advisable to use a scant amount of water in mixing the glue and then dilute it to the proper consistency with hot water after the glue has melted. In adding the hot water, a "glueometer," such as shown in Fig. 1, should be used. This is simply a hydrometer, graduated to read in percentage of dry glue. The water is added until the hydrometer reading corresponds to the percentage given in the table for the size abrasive being used.

The Importance of Temperature Control

Glue is extremely sensitive to heat. The maximum strength is obtained when it is melted at 134 degrees F. It loses strength rapidly above this temperature. Therefore, it should be melted in a thermostatically controlled glue heater, and a thermometer should be used constantly to check the thermostat. In Fig. 2 is shown a thermostatically controlled electric glue heater, which is well adapted for this work and which holds the temperature constant within 2 degrees F. Glue heaters are available in three forms with automatic temperature control, namely, steam, gas, and electric. There is no excuse for overheating glue, as the apparatus for controlling its temperature is available in commercial form.

Methods and equipment used in the proper application of glue to polishing wheels will be described in a later article.

Special Applications of Resistance Welding Machines

By M. L. ECKMAN, Research Engineer, Federal Machine & Welder Co., Warren, Ohio

Resistance welding machines may be used as forging machines in places where small production and variety in the work to be forged makes it impracticable to use standard forging machines. Collars of various sizes may be upset on shafts or studs and bolts may be headed in this way. It has been found on some types of forge work that the work can be heated by electrical resistance at 15 per cent of the cost of heating in an oil or electric furnace.

For bending, resistance welding machines are also serviceable. One firm building electric locomotives on which there is a great amount of pipe bending has installed a resistance welding machine, using it beside each locomotive for heating pipe and forming bends as needed. The machine is extremely rapid, heating pipe from 1 to 3 inches in diameter in from three to eight seconds. The bending of structural shapes in fabricating shops is also being done extensively on resistance welding machines.

Localized annealing can be carried out successfully in jig, fixture, and die work when the article must be annealed in certain local spots or areas to resist shock or to prepare it for later machining operations.

Heating for hardening can also be done successfully in a resistance welding machine. Several applications of these machines for heating uniformly shaped parts for hardening have been made in which great speed and uniform heat have been obtained at low cost. The uniformity of temperature obtained in each piece is quite remarkable. The machine used may be so designed that the current is cut off as soon as the part being heated has expanded a predetermined amount; this assures heating to a uniform temperature.

The resistance welding field is young, but remarkable developments have been made. Mechanical men in general should remember that a resistance welding machine is not confined to one line of work, but that many different sizes and kinds of articles can be welded on the same machine. The resistance welding machine is the most efficient assembling machine known.

* * *

The National Automobile Chamber of Commerce estimates that the output of the automotive industry for March amounted to 286,883 cars and trucks. This output is an increase of 25 per cent over the February output, and is the largest monthly output for the last nine months. The total production for the first quarter of 1931 is estimated at 695,000 cars and trucks.

Burnishing with Tungsten Carbide

Design of Machine in which Cams are Burnished Accurately to Size, Reducing Production Costs Eighty Per Cent

By FRED J. SANDERS

THE three-lobed cam shown in Fig. 2 is a part of the mechanism in a taximeter. It is composed of steel, carburized and hardened. Inasmuch as the cam surfaces were required to be polished absolutely smooth, without scratches, the tooling problem was a difficult one. The severity of these requirements made it necessary to give each part a close inspection under a magnifying glass.

The old method of finishing these surfaces was both expensive and unsatisfactory, as they were polished and buffed by hand. It was found that although the finish was satisfactory, the polishing eliminated any possibility of holding the measurements within close limits. Moreover, this operation had to be done by a skilled workman, and the rate of production was only twenty per hour.

With the present burnishing fixture, however, a girl operator can produce sixty parts per hour, and the cost of producing these parts has been reduced from $40 per thousand to $7.20 per thousand. In addition, the rejection of parts because of imperfections has been nearly eliminated, the quality of the part has been improved, polishing machines have been released for other work, and the inspection time has been reduced.

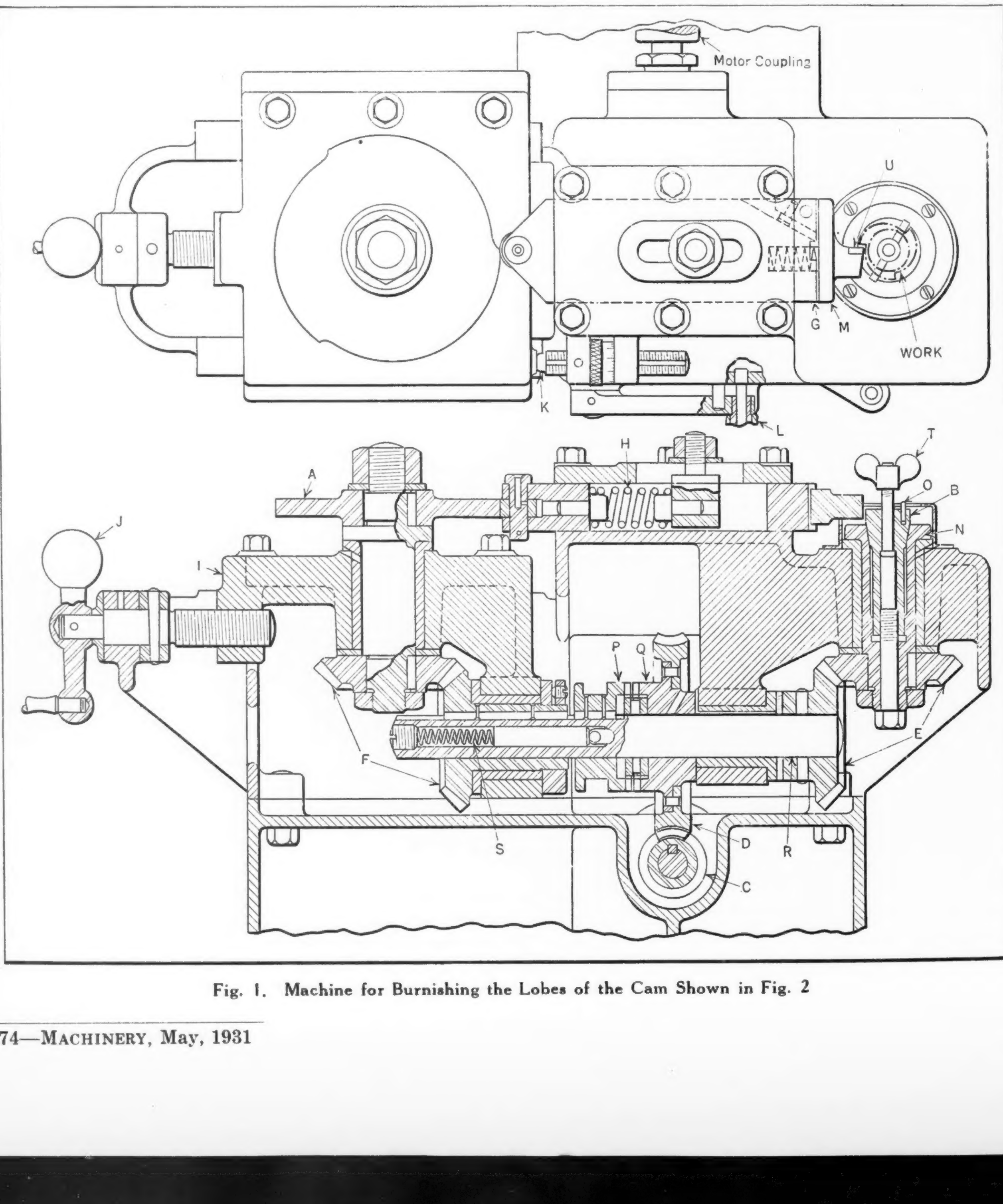


Fig. 1. Machine for Burnishing the Lobes of the Cam Shown in Fig. 2

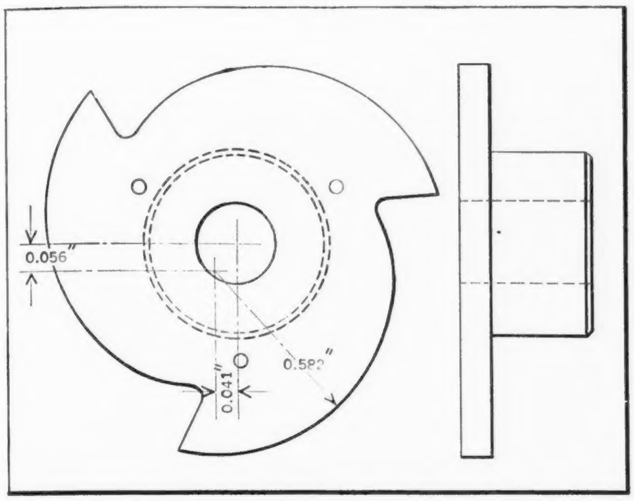


Fig. 2. Taximeter Cam which is Burnished in the Machine Shown in Fig. 1

Preliminary Operations to Facilitate Burnishing

The cams are first turned on an automatic screw machine, and then passed successively through a blanking and two shaving dies, which form the lobes and size them. The first shaving die removes 0.008 inch per side, and the second shaving die, 0.002 inch. The shaving dies also remove the break in the stock left by the blanking die and smooth the surface. When the parts have passed through the final shaving die, they are fairly smooth, showing only a fine mark around one edge where the thin shaving breaks away.

Movement of Burnishing Bit Controlled by Master Cam

The construction and operation of the burnishing machine will best be understood by referring to Figs. 1 and 3. The same reference letters are used in these illustrations to represent corresponding parts. The machine is driven by a 1/4-horsepower motor, running at 1725 revolutions per minute, which transmits the power to the master cam *A* and the work-arbor *B*, through worm *C*, worm-wheel *D*, and bevel gears *E* and *F*. Both the master cam and the work-arbor rotate at 140 revolutions per minute. The slide *G*, in which is secured the tungsten-carbide burnishing bit *U*, is held against the master cam *A* during the burnishing operation by the coil spring *H*. The use of tungsten-carbide burnishing bits largely accounts for the efficiency of the operation.

The master cam is mounted on the slide *I*, which is actuated by the screw and ball-crank *J*. A boss on this slide engages a micrometer stop *K* which is so set that the work will be burnished to the correct size. A clutch shifter *L* is provided to stop the rotation of both work and master cam without shutting down the motor, thus increasing the rapidity of the operation.

The clutch jaws *P* and *Q* each have five teeth milled on their faces which are carburized and hardened. The worm-wheel *D* is riveted to one clutch jaw, which turns idly on shaft *R*, while the work and master cam are stationary. When the clutch jaws are engaged, motion is transmitted to the work-arbor *B* and master cam *A* through the bevel gears *E* and *F*, respectively. The clutch *P* is keyed to the shaft *R* on which it has a longitudinal sliding motion. This shaft is made hollow for about one-half its length to provide space for the compression spring *S*. The purpose of this spring is to keep the sliding clutch jaw engaged solidly with the other jaw when the machine is in operation.

Compensation Provided for Variation in Work

Owing to the difficulty of making the master cam an exact duplicate of the parts produced by the shaving dies, it was found necessary to provide some means of compensation. This was done by securing to the end of the ram a movable member *M*, which is backed up by a heavy spring. In mem-

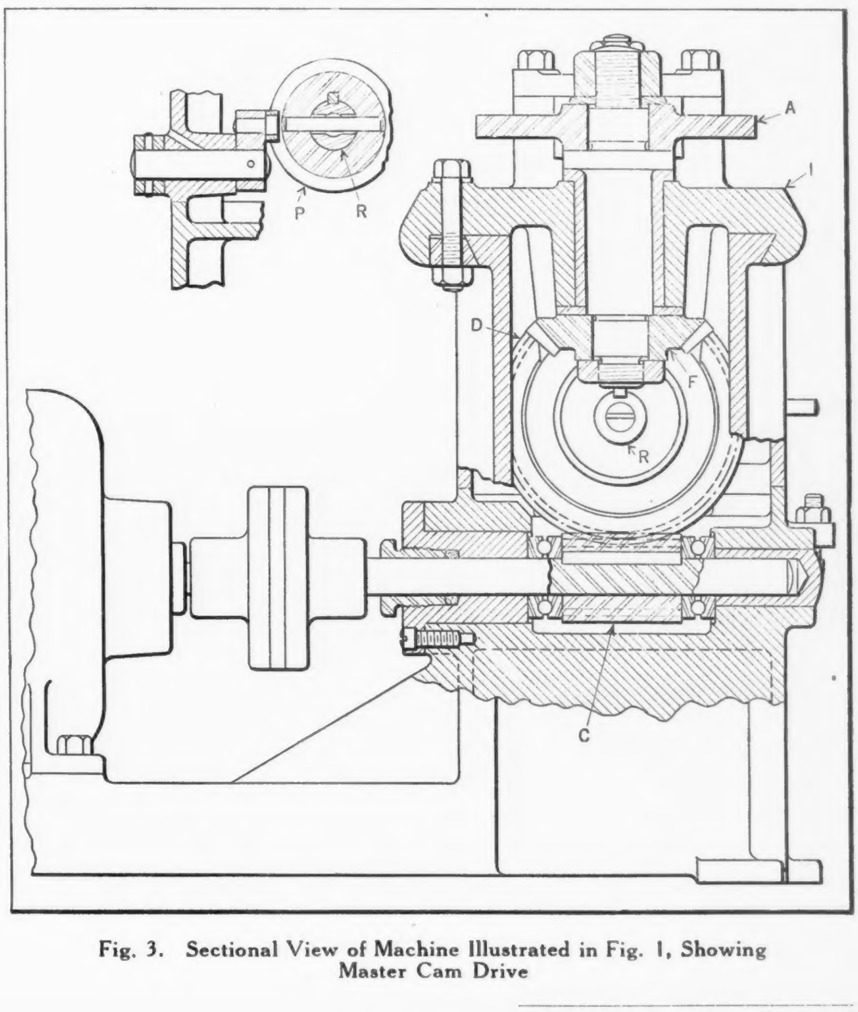


Fig. 3. Sectional View of Machine Illustrated in Fig. 1, Showing Master Cam Drive

ber M is held the tungsten-carbide bit. The amount of movement required to compensate for the difference in the master cam and work is less than 0.010 inch, but it is sufficient to allow the tool to follow any small irregularities on the surface being burnished.

The work-arbor B is held securely in the tapered hole in the spindle N by means of a draw-bar. This arrangement provides a means of timing the work with the master cam. By loosening the draw-bar and tapping the head lightly, the work can be rotated in either direction as much as desired and then clamped into place again.

The top face of the arbor B against which the work is clamped is corrugated to prevent the work from slipping. The work is located relative to the master cam by three pins, one of which is shown at O. These pins engage three holes drilled in the work.

The base of the machine is made in two sections for convenience in casting and machining. The work- and cam-spindles are hardened and ground, and run in phosphor-bronze bushings.

Interchangeable Master Cams Provided for Similar Work

In operation, the work is secured on the arbor B by means of the wing-nut T. The clutch lever is then swung to the right, starting the machine in motion. The burnishing tool U is now fed to the work by means of the ball-crank handle J. When the cam-slide I reaches the micrometer stop K, the feeding movement is discontinued and the work is allowed to revolve until a highly polished surface is obtained. The cam-slide is then fed back to the starting position, and the work removed. The entire operation consumes only 57 seconds. This fixture is also used for burnishing cams having two and four lobes, corresponding master cams being used to replace the one shown.

Six Sides of Nuts Ground in One Operation

Equipment that Finishes All Sides of Hexagonal Nuts in One Loading and Three Passes Between the Grinding Members

THE six sides of hexagonal nuts are ground in three passes between the abrasive members of the machine illustrated in Fig. 1, two sides being ground at each pass. The nuts are indexed 60 degrees before the second and third pass. At the completion of the operation, the nuts are discharged automatically from the machine. Brass nuts of the size seen in Figs. 1 and 2, which measure 1 5/16 inches across flats, are finished complete at the rate of 30 per minute, or 1800 per hour. The nuts shown in Fig. 3 are made of steel. They measure 2 3/8 inches across flats and are finished at the rate of 12 per minute, or 720 per hour. All this equipment was made by the Gardner Machine Co., Beloit, Wis. Both machines have abrasive disks 23 inches diameter by 1/2 inch thick.

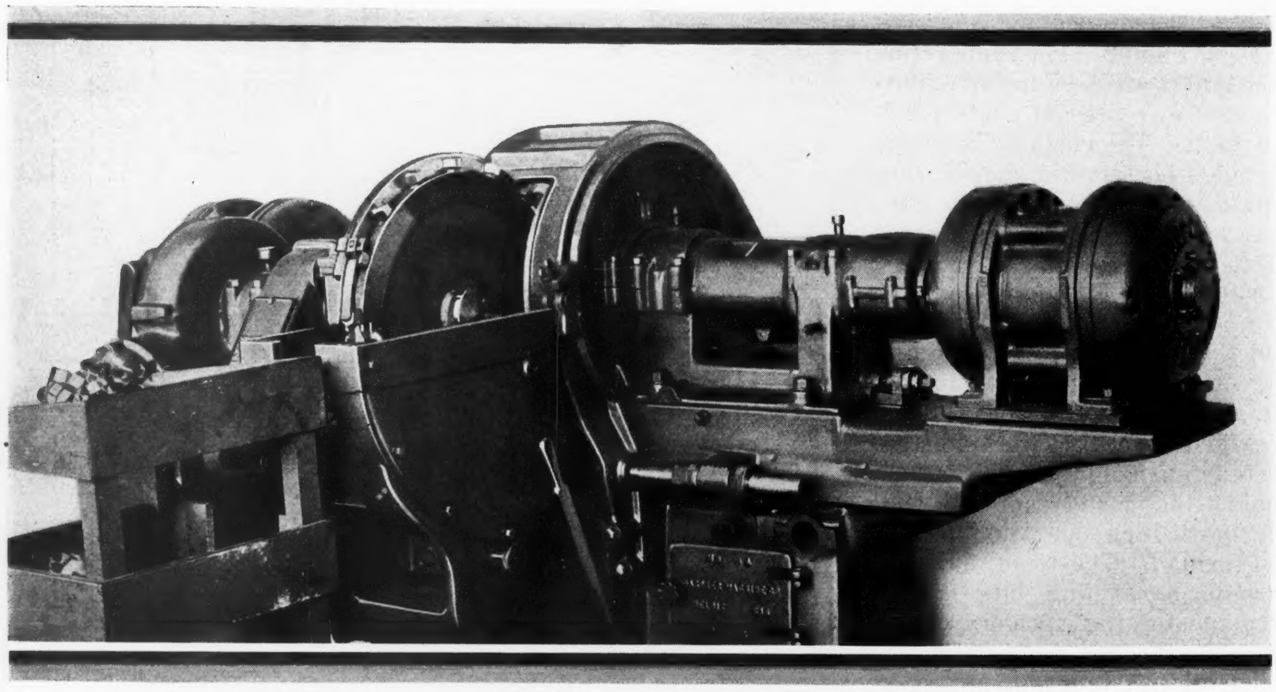


Fig. 1. Machine that Grinds All Six Sides of Hexagonal Nuts in One Loading and Three Passes between the Abrasive Members

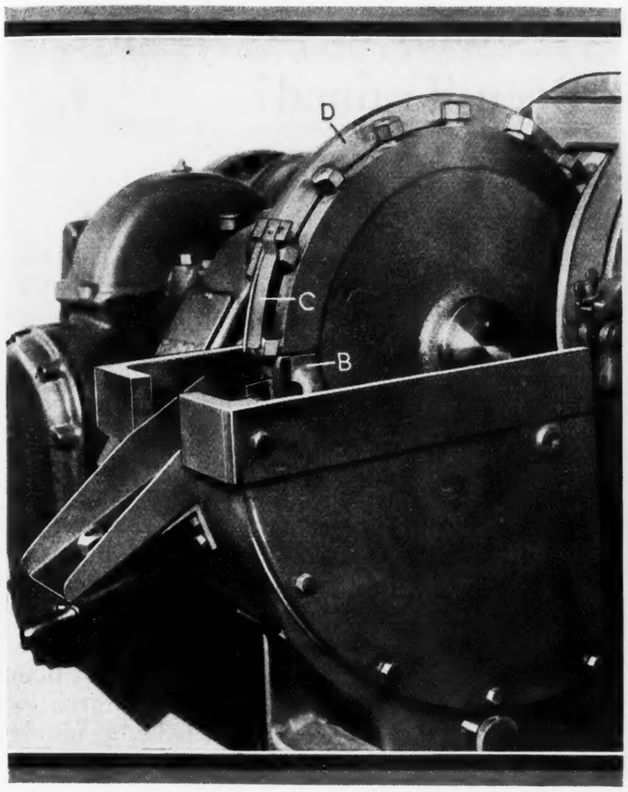


Fig. 2. Each Nut is Indexed 60 Degrees before the Second and Third Passes to the Grinding Members

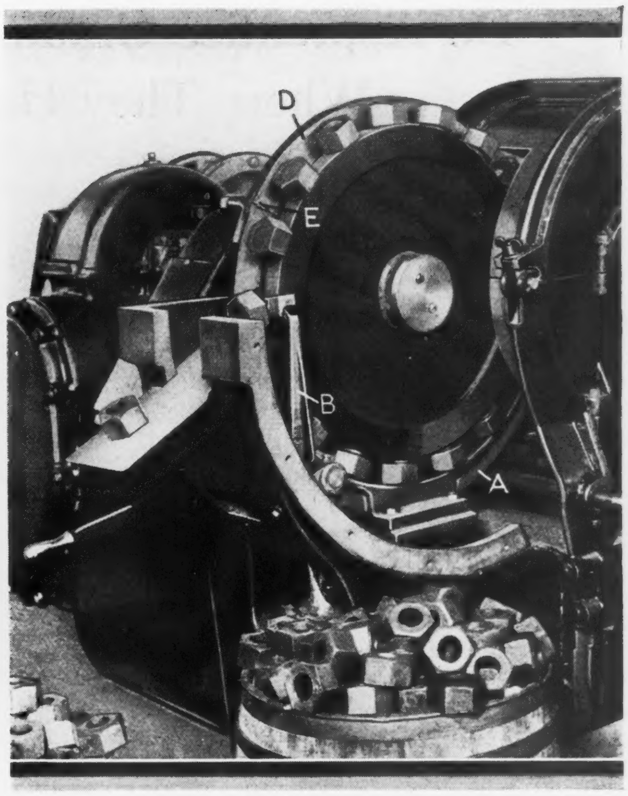


Fig. 3. After the Six Sides Have Been Ground in Three Passes, the Nut is Automatically Ejected

Probably the most interesting feature of this equipment is the means employed for discharging the nuts. The unfinished nuts are slipped over the studs of the carrier by an operator standing at the front of the machine. As they approach the grinding members, arm *A*, Fig. 3, which extends up between the abrasive members, holds the nuts on the studs while they are being ground.

Attached to the front of the carrier are two ejector levers *B* (one on each side) which operate against every third nut and force it from the stud on which it is held. The number of studs spaced around the carrier is such that at each revolution of the unit, a distance of one stud is gained on the ejector levers. Thus, with respect to any one stud, these levers operate only once in approximately 3 1/4 revolutions of the carrier. During this interval each nut is carried three times to the abrasive members. The ejector levers are actuated by a cam. A spring clip *C*, Fig. 2, pushes the nuts firmly back on the studs for the second and third passes to the grinding members.

Method of Indexing the Studs

On one side of the carrier there is a stationary guide *D*, which insures that the nuts will reach the abrasive members with the sides properly aligned, since they cannot be placed on the studs with a corner in contact with this guide.

Indexing of the nuts through 60 degrees before the second and third passes to the abrasive members is accomplished by means of a small rectangular plug *E*, Fig. 3, which projects beyond the face of guide *D* and causes the nuts to swivel one-sixth of a revolution in order to pass by. A recess in the guide permits the nuts to turn.

Standardization of Splines and Splined Shafts

Two committees have been formed under the procedure of the American Standards Association, 29 W. 39th St., New York City, for standardizing splines and splined shafts. R. E. W. Harrison, chief engineer of the Cincinnati Grinders, Inc., is chairman of the committee appointed to undertake the development of spline standards suitable for the machine tool industry. Another committee, under the chairmanship of W. L. Barth, standards engineer of the General Motors Corporation, will develop spline standards for the automotive and aeronautical industries. These committees will act independently of each other, although the recommendations of both will be submitted for the approval of the general committee on small tools and machine tool elements which is under the joint sponsorship of the American Society of Mechanical Engineers, the National Machine Tool Builders' Association, and the Society of Automotive Engineers.

Do Apprentice Graduates Remain in the Shop Where They Have Been Trained?

By C. J. FREUND, Apprentice Supervisor, The Falk Corporation, Milwaukee, Wis.

AN important question to every employer contemplating an apprentice training course is this: Will the apprentices who have completed their training continue to work for the employer who has taken the trouble to train them or are they likely to obtain employment elsewhere?

Not long ago, an employer admitted, in discussing apprenticeship training, that there was no need for him to bother about training young mechanics, because he could hire all the young men he needed from among those who had been trained in other plants. Just as long as some manufacturers take this attitude, others will hesitate to train apprentices, because they feel that their efforts will be futile.

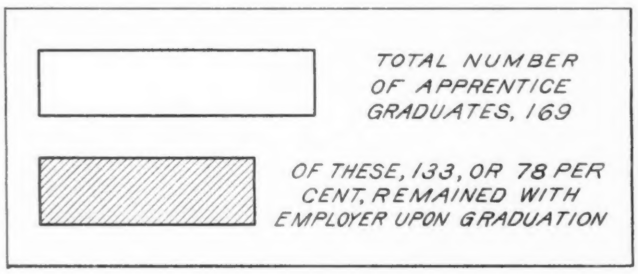


Diagram that Answers the Question Asked in the Title of This Article

Those who hesitate will be glad to learn just what proportion of graduate apprentices are likely to remain with an employer under ordinary conditions. In order to find an answer to this important question, the records of the Falk Corporation were examined to ascertain how many apprentices graduated between January 1, 1924, and May 30, 1930. In that period, 169 apprentices were graduated from all departments of the plant. Of these, 133—or 78 per cent—remained in the employ of the firm after graduation.

The records also indicate that this percentage has increased in recent years. For instance, in 1929 all the seven apprentices who graduated from the foundry department remained with the company; of the eleven apprentices who graduated from the machine shop, ten remained; and of the nine apprentices who graduated from other departments, eight remained.

The proportion of graduates who remain can be largely controlled by the employer through the expedient of maintaining a correct quota of apprentices in proportion to the total number of employes in the plant. No more apprentices should be graduated than are needed to fill current vacancies for skilled men in the organization. If more are trained, it is to be expected that they will look outside the organization for the opportunities to which they think that they are entitled.

Moreover, it is not a foregone conclusion that it is desirable to retain all graduates. Many competent authorities hold that the young journeyman must travel about to round out his experience. If all manufacturers in a certain branch of the industry maintain adequate apprentice systems, no one loses through this, as there is merely an exchange of trained men between firms who are all doing their duty to the industry in this respect.

The Power to Visualize as an Asset to Engineers

The School of Mines and Metallurgy of the University of Missouri, Rolla, Mo., has made an investigation, based upon the experience of 168 prominent engineers and engineering teachers, on the value of the power to visualize in engineering. The results from this questionnaire indicate that engineers are of the opinion that the power to visualize is of great importance, if not indispensable, to engineers, especially to those whose work is of a creative nature—that is, those who are engaged in the planning and designing of machines or structures. The trait is not so necessary, of course, for the engineer who may be engaged merely in doing routine work.

The investigation indicated that in developing the visualizing faculty, descriptive geometry is outstanding, with mechanical drawing and machine design close seconds. Kinematics, graphic statics, and physics are considered much less important, and chemistry is rated as of small value in developing this trait. The investigation has also disclosed that engineers, on the whole, are possessed of a high degree of imagination when it comes to creating mental pictures of occurrences.

The conclusion of the study is that the power to visualize is a trait of such value in engineering that it is highly worth while to develop it in the engineering student. Further study will be given to methods of accomplishing this, so that a scientific answer can be given as to whether any particular course or college training can definitely develop this trait.

A Crowning Fixture of Unusual Design

Turning a Crown Surface by Up and Down Movement of Vertical Tool-slide on Lathe Turret

By CHARLES C. TOMNEY, Chief Tool Designer
Brunswick-Kroeschell Co., New Brunswick, N. J.

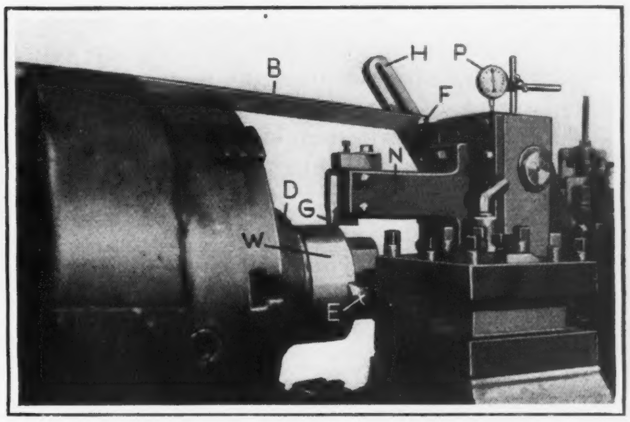


Fig. 1. Taking a Semi-finishing and a Crowning Cut Simultaneously on Three-inch Face of Part Shown in Fig. 2

IN Fig. 1 is shown a fixture employed for turning a crown surface on eccentrics like the one shown in Fig. 2. The amount of crowning or barreling required on these parts is only 0.003 inch; in other words, the diameter at the center is only 0.006 inch larger than it is at the ends. The surface finished by the crowning operation is indicated by the dotted lines at *W*.

Although this fixture was designed rather hurriedly to avoid the difficulty experienced in trying to keep a forming tool sharp, it has been producing satisfactory work for a considerable time. The forming tool previously employed would not stand up under repeated cuts, owing to the fact that many of the castings were very hard and often contained sand spots. For this reason, the single-point tool employed in the fixture shown in Figs. 1 and 3 proved more satisfactory.

In using the crowning fixture, the work is clamped in the chuck *D*, Fig. 1, which is mounted on the faceplate of a lathe. One roughing cut is taken with the tool *E*, and a second or semi-finishing cut started with the same tool. When the tool has traveled a distance of about 3/8 inch, the crowning fixture is brought into position and the lever *B* dropped over the fulcrum stud *F*. The tools *E* and *G* then cut simultaneously, the crowning tool following tool *E*.

Tool *E* turns the work to within 1/64 inch of the required diameter and tool *G* finishes the work to the required size, with the correct amount of crown, in one cut. At the start of the crowning cut, the lever *H*, Fig. 3, is off center, in the position indicated by the dotted lines at *S*. As tool *G* travels across the eccentric, the lever *H* swings to the other side until it reaches the position indicated by the dotted lines *T*. Thus the fulcrum stud *F* has a movement of 1 1/2 inches either side of the center line. This movement of lever *H* transmits the up and down movement to the holder *N* and tool *G* that is required to produce the crown on the face of the eccentric.

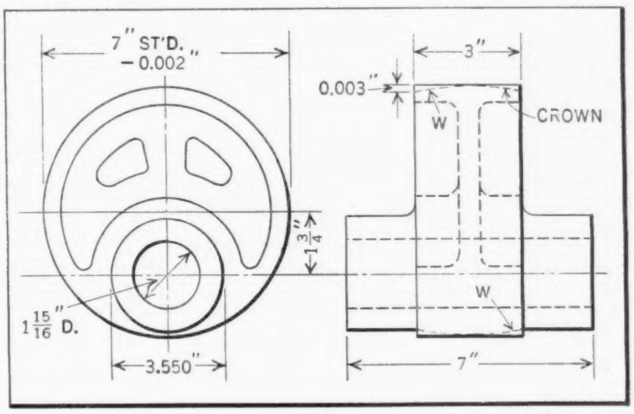


Fig. 2. Eccentric on which Crown is Turned with Equipment Shown in Fig. 1

The movement is transmitted to holder *N* by the crankshaft *A* to which lever *H* is secured. On the eccentric crank portion of shaft *A* are fitted the two bearing blocks *K* which are a sliding fit between the lugs *L*. These lugs are cast on the slide *M* to which holder *N* is bolted. The set-screws *O* which bear against a gib can be adjusted to take up wear on slide *M*. The throw of crankshaft *A* is 3/16 inch, and the distance of fulcrum pin *F* from the center of the crankshaft is 8.230 inches.

The latter dimension was determined in rather an interesting manner. After deciding upon a throw of 3/16 inch for the crankshaft, the table of segments of circles in MACHINERY'S HANDBOOK was consulted. By dividing 0.003, or the amount of crown required, by 0.1875, or the throw of the crankshaft, we have $\frac{0.003}{0.1875} = 0.016$, which corresponds nearly to the height *H* given in the table of segments for a center angle of 21 degrees and a radius of 1 inch. Therefore, we have an angle of 10 degrees 30 minutes between the vertical center line of the lever *H*, Fig. 3, and its center line when at either the extreme left-hand position *S* or the extreme right-hand position *T*.

Now in turning an eccentric 3 inches wide, it is obvious that the fulcrum pin *F* will travel 3 inches, or 1 1/2

inches on each side of the center line. It is evident, therefore, that the distance of the fulcrum pin F from the center of the crankshaft is represented by the hypotenuse of a triangle having an angle equal to 10 degrees 30 minutes, with the opposite side equal to 1 1/2 inches. Thus the distance from the center of the crankshaft to the center of the fulcrum pin F equals $\frac{1.5}{\sin 10 \text{ degrees } 30 \text{ minutes}} = 8.230$ inches.

These calculations were used in designing the fixture. In actual practice, however, the indicator shown at P, Fig. 1, is used in checking the final adjustment of the fulcrum stud F. By moving the turret along 3 inches, or a distance equal to the width of the eccentric, the maximum fluctuation in the reading of the indicator must equal 0.003 inch, which corresponds to the amount of crown given the work; if it does not, the fulcrum stud F must be readjusted.

Provision is made for changing the location of the holder N, Fig. 3, on the slide M to accommodate eccentrics of different diameters. The same arm B, Fig. 1, and holder N are employed in crowning eccentrics of different widths and diameters. This was made possible by so designing the chucks for holding the different sizes of eccentrics that the center of the work in each case would be the same distance from the lathe faceplate.

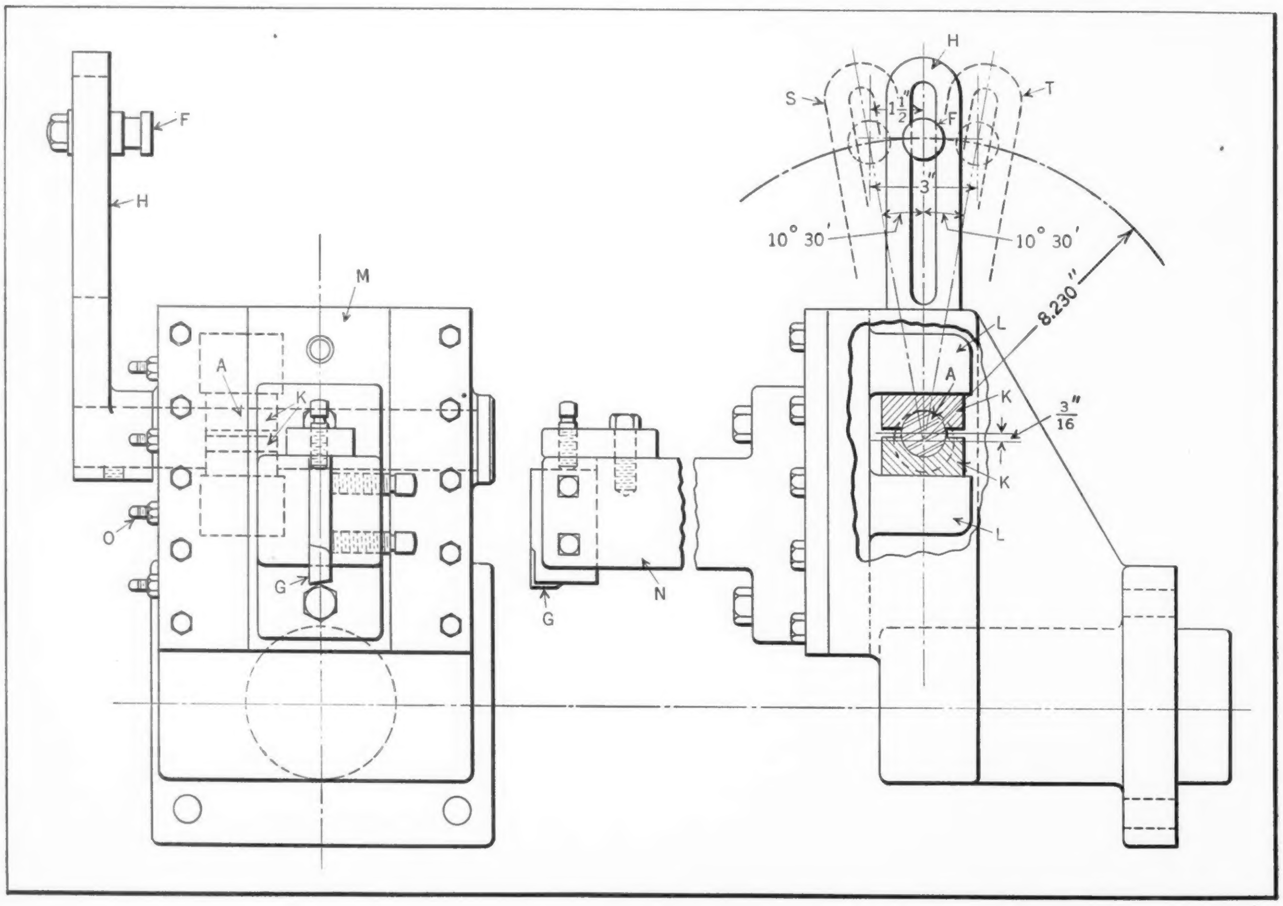


Fig. 3. Details of Crown-turning Fixture Shown in Fig. 1

Annual Meeting of American Welding Society

The annual meeting of the American Welding Society was held April 22 to 24 in the Engineering Societies Building, 29 W. 39th St., New York City. A large number of papers dealing with various phases of welding practice were read and discussed. Among the subjects covered were the welding of boilers for the United States Navy, and the fusion welding of high-pressure vessels in general.

The arc welding of copper alloys was another of the topics discussed. Electrolytic copper sheets up to 1/8 inch in thickness can be readily metal-arc-welded, using copper electrodes. The weldability of brass is limited by the tendency of the zinc to burn out in the heat of the arc; but sheets of brass containing 35 per cent of zinc or less can be metal-arc-welded, using a phosphor-bronze electrode.

* * *

The expression "the white coal of Switzerland," referring to its waterpower which has been so extensively used in hydro-electric developments, acquires increased significance when we note that approximately 160,000 kitchen ranges in that country "burn" this white coal—that is, use electricity exclusively for the heating medium.

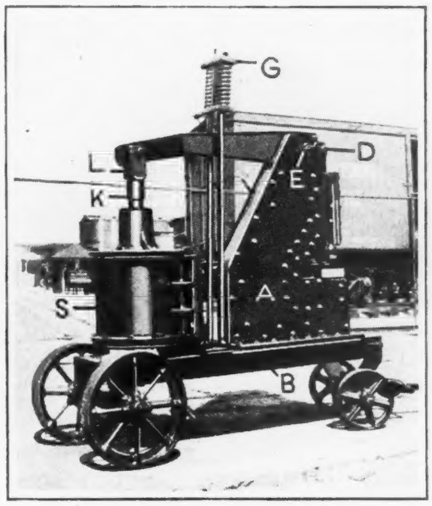
Special Tools and Devices for Railway Shops

Equipment Employed in Locomotive Repair Shops, Selected by Railway Shop Superintendents and Foremen as Good Examples of Labor-saving Devices

A Portable Pneumatic Punching Machine

By H. H. HENSON, Foreman
Machine and Erecting Shops
Southern Railway Co.

The illustration shows a simple but powerful pneumatic punch, mounted on roller-bearing wheels that enable it to be moved easily about the shop or yards. This equipment has proved of great value in punching sheet metal used for railroad box cars. It will punch holes from 3/16 up to and including 1 inch in diameter in steel sheets from 1/8 to 3/4 inch thick.

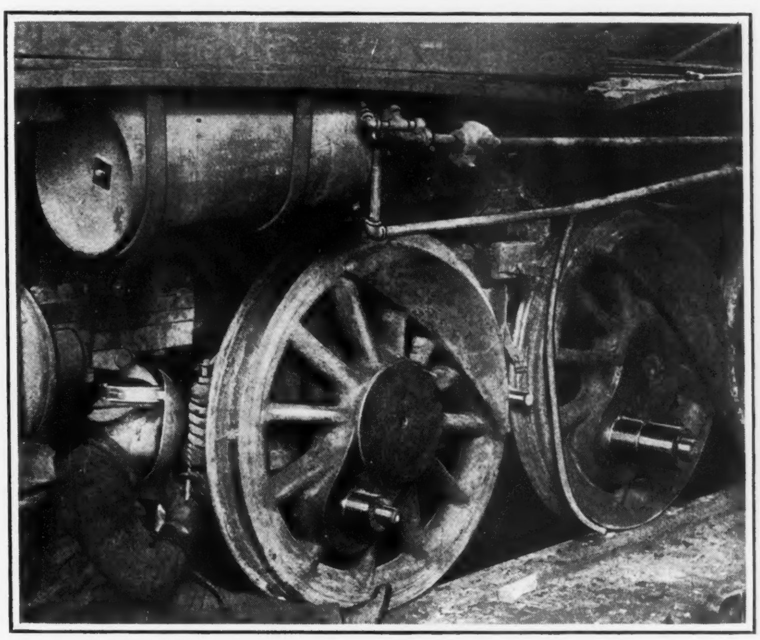


Portable Pneumatic Punch with Capacity for Punching Steel Sheets 3/4 Inch Thick

The punches and dies are of standard sizes and shapes, and can be purchased from manufacturers of such equipment. The most important detail is the construction of the steel frame *A*, which is made of two steel plates, each 3/4 inch thick, reinforced on the inside by two forged steel frames 3 inches thick and 5 inches wide, which are bent to the shape indicated by the outline formed by the rivets. The frames are riveted to each other with 7/8-inch rivets and to a channel iron *B*, which is 1 inch thick, 16 inches wide, and 56 inches long.

The punch-operating lever connected to cross-head *L* is 1 3/4 inches thick by 36 inches between centers, the center distance between the fulcrum *E* and the center of the toggle joint *D* being 5 1/2 inches. The lever is actuated by a 16- by 12-inch Westinghouse air brake cylinder *S*, which is bolted to an angle bracket on the frame. At *G* is a buffer, the purpose of which is to retard the lever before the piston in the cylinder strikes the top cylinder head. The piston-rod *K* and cross-head *L* are steel forgings.

A detachable air hose connection is fastened to the air valve, so that connection can be made with any of the compressed air lines in the shop or yard. This pneumatic punching machine can be made at a comparatively low cost, and will soon pay for the labor and material required. One of the most important points to consider in constructing the machine is the fulcrum pin, toggle joint pins, and bushings. These should be made of tool steel and hardened, as they have to withstand high stresses.

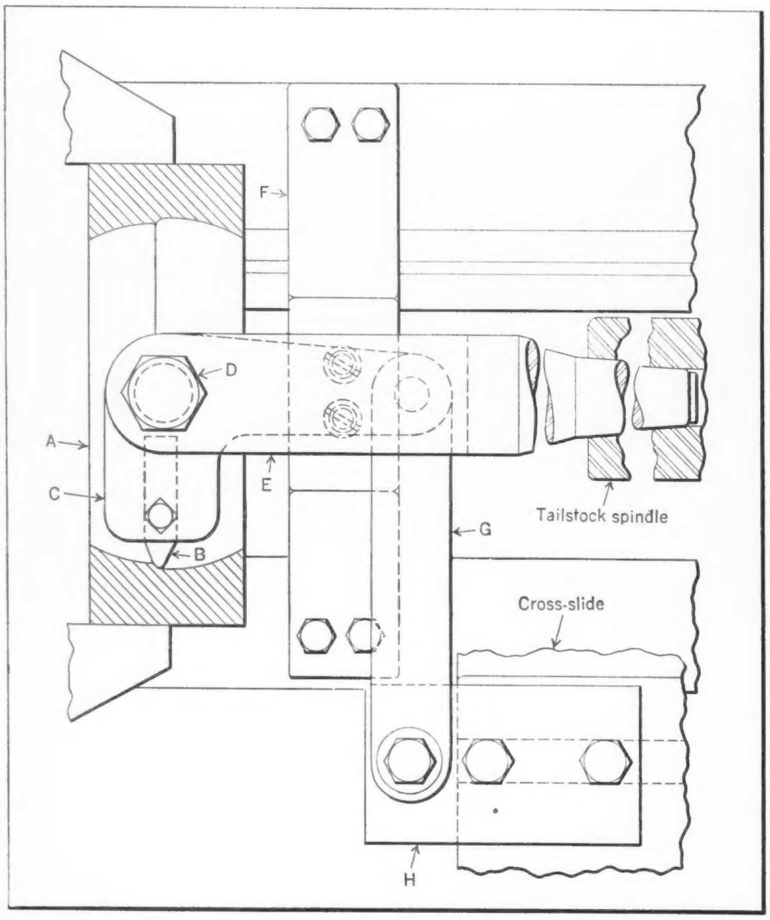

Building up a Flat Spot on a Locomotive Wheel Tire by Electric Welding. The Work is Done with General Electric Equipment in the Toledo & Ohio Central Shops at Bucyrus, Ohio

Spherical Boring Fixture for Side-rod Retaining Bushing

By E. A. LOTZ, Foreman
Pennsylvania Railroad Shops, Juniata, Pa.

Steel retaining bushings for confining the ball bushings in locomotive side-rods are bored to a spherical shape, as indicated at *A* in the illustration (see next page). The lathe boring fixture shown guides the cutter *B* in its circular path.

The cutter is clamped in the swinging angle-arm *C*, which pivots about the stud *D*, secured in the forked bracket *E*. This bracket is stationary and is supported very close to the work by means of the frame *F*, which is clamped to the lathe ways. The right-hand end of bracket *E* is tap-



Lathe Fixture for Boring Spherical Hole in Side-rod Retaining Bushing

ered to fit the center hole in the tailstock, thus providing additional support for the bracket.

One end of link *G* is pivoted to the angle-arm, and the other end to the plate *H*. This plate is fastened to the cross-slide in place of the tool poppet. As the slide is fed forward, the required circular movement is imparted to the cutter through link *G* and angle-arm *C*. All parts are proportioned to facilitate the loading and unloading of the work.

* * *

A George Stephenson Memorial

It is of interest to note that the visitors from the United States and the European continent coming to see the little house at Wylam, England, in which George Stephenson, the great pioneer in railroad engineering, was born, outnumber the visitors from the British Isles. The house is about two hundred years old. In 1929, a tablet was placed on the building recording it as the birthplace of Stephenson. A replica of this tablet has been made and presented to the Institution of Mechanical Engineers of Great Britain. The tablet, in addition to the inscription, shows a bas relief of the "Rocket," the famous Stephenson locomotive. What a difference a hundred years makes! A Committee of Parliament ridiculed Stephenson when he assured them that he could foresee when steam locomotives would run as fast as 20 miles an hour.

Birmingham Spring Meeting of Mechanical Engineers

The semi-annual meeting of the American Society of Mechanical Engineers, held this year in Birmingham, Ala., April 20 to 23, offered more of interest to the engineer in the power engineering and the iron and steel field than to the man especially interested in machine shop practice. This was to be expected, inasmuch as Birmingham is a center of the iron and steel industry, with important power developments in the vicinity. In conjunction with the meeting, however, there was one session on materials handling and machine shop practice, dealing especially with the handling of materials in the automotive machine shop and with foundry practice.

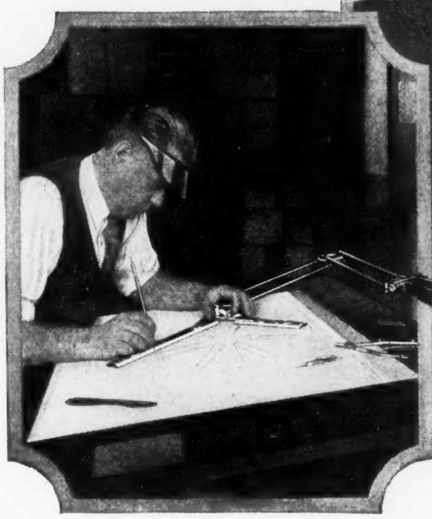
The papers pertaining to the iron and steel industry dealt especially with centrifugally cast pipe, a subject which is becoming increasingly important. One of the papers described briefly the important features of the DeLavaud process, and indicated the general characteristics of the pipe produced in this way. The casting machines and annealing furnaces used in this process were described in detail.

The pipe produced is very dense and close-grained. It is free from blowholes, impurities, and sand and slag inclusions. As a result, the pipe possesses unusually good mechanical properties. The tensile strength, for example, varies from 30,000 to 35,000 pounds per square inch. Furthermore, as the pipe is cast in a permanent mold, it is exceptionally accurate in size and contour, being of uniform circumference and having unusually smooth exterior and interior surfaces.

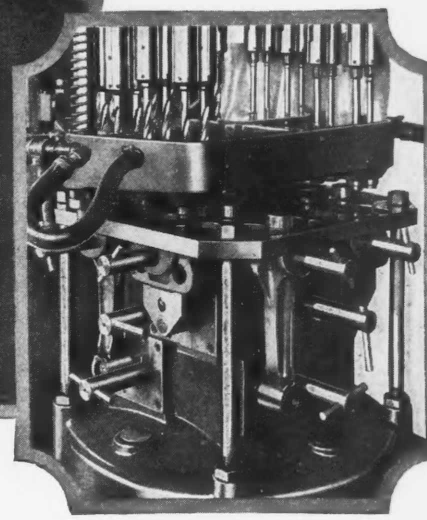
Another paper dealt with the so-called "Mono-cast centrifugal sand-spun pipe," especially with pipe so made in the larger sizes—that is, in sizes 12 inches in diameter and larger. The paper on the DeLavaud process was presented by S. B. Clark, research engineer of the U. S. Pipe & Foundry Co., Burlington, N. J. The one on the Mono-cast system was read by S. D. Moxley, chief engineer of the American Cast Iron Pipe Co., Birmingham, Ala.

* * *

At the present time more than one hundred municipal building codes permit the erection of arc-welded structures. J. F. Lincoln, president of the Lincoln Electric Co., states that not one failure has occurred in the arc-welded building structures that have been erected to date, which now number over one hundred. He therefore believes that the next few years will see a considerable increase in the application of the arc-welding process to structural engineering work.



Design of Tools and Fixtures



Fixture for Cutting Fabric Gear Blanks from Sheets

By ELMER C. COOLEY, Syracuse, N. Y.

The fixture shown in Fig. 1 is used for cutting gear blanks from materials such as Textoil, Formica, or Micarta. A trepanning tool fitted with a special drill is used for cutting out the hole as well as the blank.

The material is purchased in large sheets, in this particular case 35 by 42 inches. As sheets of this size are too large to be handled conveniently, they are first cut into strips by means of a circular saw. The widths of the strips are, of course, dependent on the diameter of the blank.

Referring to Fig. 1, the center distance *A* between two cuts in the same row is equal to one-half the outside diameter of the cutter plus one-half the diameter of the gear blank plus 1/32 inch. The distance *B* between the rows is equal to the distance *A* times the cosine of 30 degrees. It will be noted that the cuts run into each other, thus providing a free escape for chips.

The fixture is equipped with a spacing bar *C* into which are driven two dowel-pins *P*. In the index-finger *D* are driven two pins *E*, the protruding ends

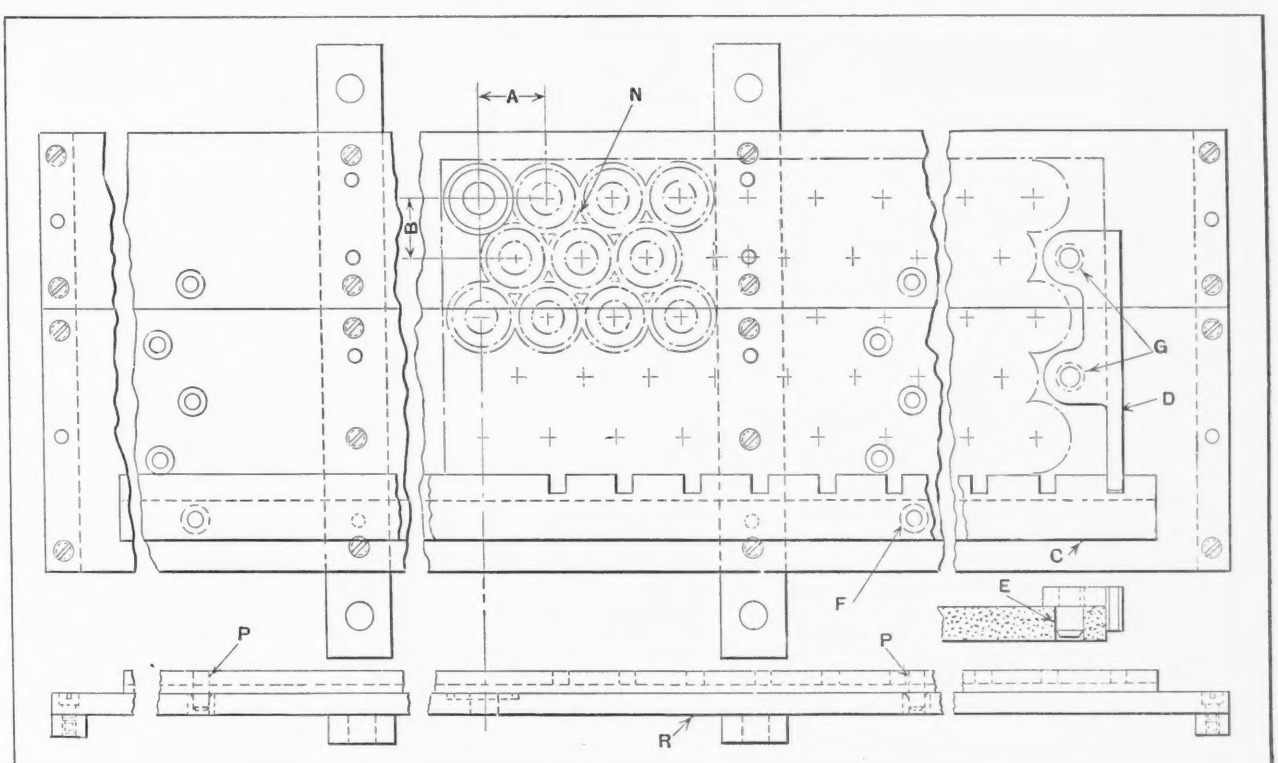


Fig. 1. Fixture for Holding and Indexing Fabric Sheet during Trepanning Operation

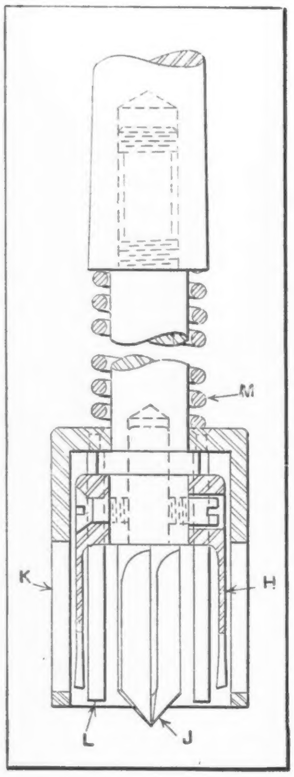


Fig. 2. Trepanning Tool Used in Fixture Shown in Fig. 1

of which enter holes drilled in the strip. Five pairs of hardened bushings *F* are pressed into the baseplate *R*, to locate the spacing bar *C* for the five rows of blanks. The baseplate is made of two widths of cold-rolled steel, and is long enough to support the sheet along its entire length while the blanks are being cut.

Two holes *G* are drilled in the end of each strip and into these holes are driven pins *E* in the finger. The first row of blanks is cut out with the spacing bar in the position shown. Then the bar is moved to the next pair of bushings, and the second row of blanks is cut. When the last row is cut, the sheet will be entirely consumed except for the small end covered by the index-finger *D*. After a number of these ends have accumulated, they are cut up by means of a band saw, and turned in a lathe to form blanks similar to those obtained from the other part of the sheet.

The cutter assembly (Fig. 2) consists chiefly of the cutter *H*, a drill *J* having three flutes, and the pressure ring *K* which holds the strip down on the baseplate. Three ejector-pins *L* in the pressure ring force the blank out of the tool on the upward stroke, through the action of the spring *M*. It is very important to have the width and depth of the gashes between the cutter teeth of the correct proportion. Otherwise, waste pieces *N* (see Fig. 1) will get in between the teeth and cause breakage of the cutter.

With the equipment described, 575 blanks, 1 3/8 inches in diameter, are obtained from each sheet, or a hundred more than were obtained by the former method of sawing the strip into squares and then drilling and turning the squares. Moreover, two operations were eliminated by the new method.

Guides for Cross-drilling in a Screw Machine

By HAROLD P. BERRY, Camden, N. J.

To perform a cross-drilling operation in an automatic screw machine before the piece is severed from the bar, it is necessary to use a drill guide to prevent the drill from being deflected. The design shown in the illustration is used for this purpose, and is applicable to a Brown & Sharpe screw machine in conjunction with the standard cross-drilling attachment held in the rear cross-slide.

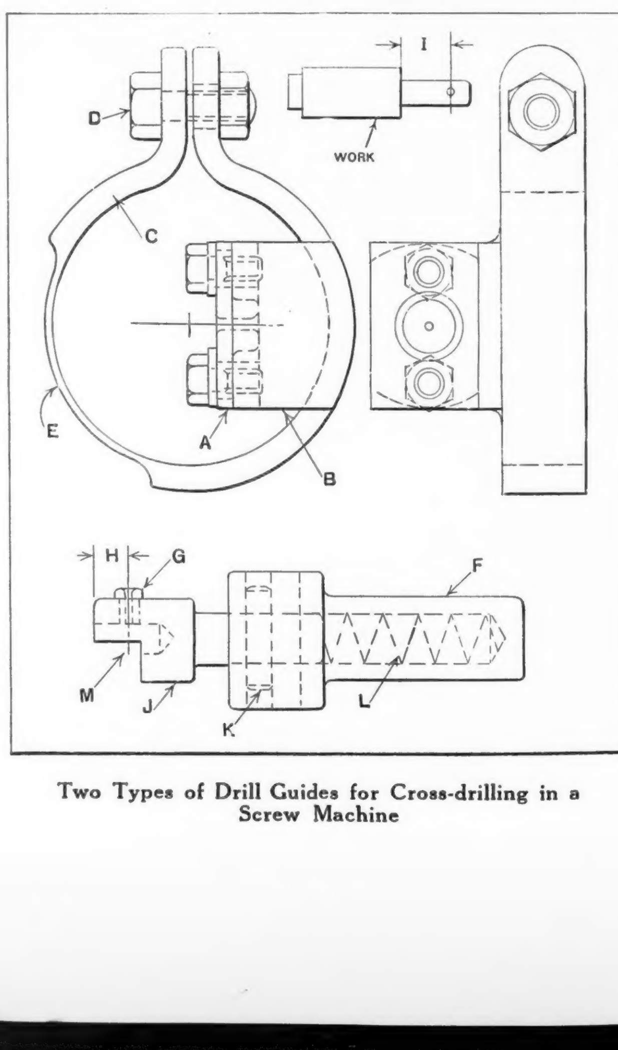
The drill guide bushing shown at *A* is secured to the arm *B* by two cap-screws, the arm being integral with the split ring *C*. This ring is clamped to the nose-piece or cap over the spindle nose of the machine by the bolt *D*, and is located in position to suit the cross-drilling attachment.

Reasonably close limits can be maintained between the hole and the end of the work by close adjustment of the cut-off tool held in the front cross-slide, and by accurate adjustment of the guide bushing *A*. Provision is made for adjusting the bushing by enlarging the cap-screw clearance holes.

Longitudinal adjustment of the guide is effected by means of the regular work-stop. To prevent interference between the fixture and the front cross-slide, clearance is provided on the ring at *E*. This drill guide may be constructed by forming the ring clamp *C* from flat machine or cold-rolled steel and welding the arm *B* to its outer edge.

Another type of drill guide used with the standard cross-drilling attachment on the machine mentioned is shown in the lower view. This guide is held in the turret of the machine by the shank *F* and clamped in position with the drill bushing *G* parallel with the drill. The center of the drill bushing is located at a distance *H* from the end of the drill bushing carrier *J*. This corresponds with the distance *I* shown on the work.

The drill bushing carrier *J* is kept in the same radial position by means of the pin *K*, and is held against the shoulder of the work by the action of the spring *L*. This construction provides compensation for any slight longitudinal movement of the



Two Types of Drill Guides for Cross-drilling in a Screw Machine

turret. To prevent interference between the cross-slide tool-holder and the drill guide, a clearance is provided at M in the head of the drill bushing carrier.

In use, the drill guide should be located as close to the collet as possible to insure against springing of the work from the pressure of the drill. One of the advantages of the guides described is that a finishing cut may be taken after drilling, so that the burr resulting from the drilling operation will be removed. These guides will also be found to operate advantageously in drilling cotter-pin holes having location limits of plus or minus 0.002 inch.

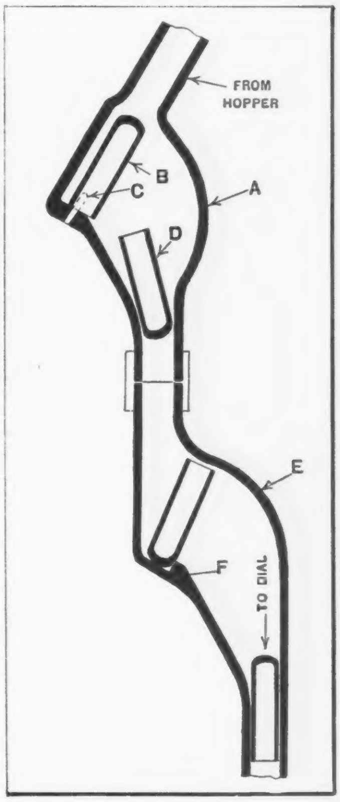
Inverting Shells Fed from Hopper

By C. G. WILLIAMS, Chief Engineer
Green Bay Barker Machine & Tool Works, Green Bay, Wis.

The upper half, or member A, of the device shown in the accompanying illustration was devised to bring the shells B to the operating dial of a press with their open ends up. When a shell B is fed from the hopper with the open end down, it falls over the pin C, which causes it to pivot about the open end and fall in the inverted position shown at D.

A vertical heading machine constructed at a later period required the shells to be fed to the dial with their open ends down. To meet this requirement, the lower member E of the device was attached to the upper member A. The closed end of the shell is stopped by the ledge F in the lower member, and the shell is tilted forward, so that it enters the dial open end down. The simple addition of the lower member E eliminated the necessity for designing a complicated selecting mechanism such as would be required to feed the shells directly from the hopper with their open ends down.

With the inverting device shown in the illustration, it was simply necessary to provide a stirring mechanism for the hopper, which would keep the shells from clogging the outlet to the chute, and a slide which would open the chute at every stroke of the press to admit a single shell. With this arrangement, it will be seen that there is no clogging of the shells in the inverting device or at the dial.



Shell Inverting Device Used with Hopper Feed

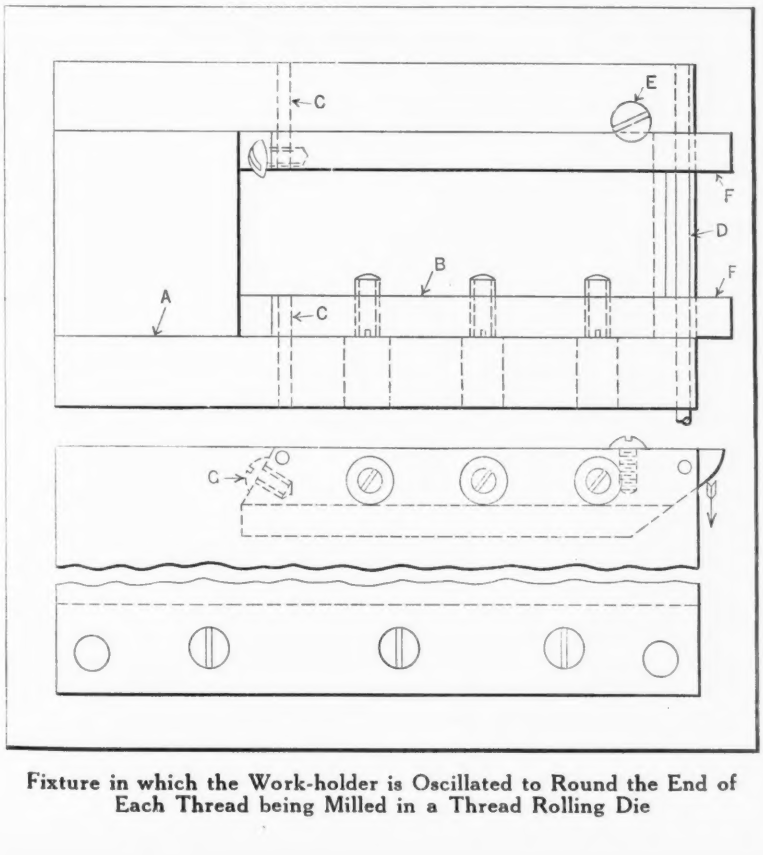
Fixture for Milling a Curved Surface

By JOSEPH ABBAZIA, Stamford, Conn.

The fixture shown in the illustration is used for milling a curved surface at the ends of the thread grooves on dies employed for thread rolling. These dies are made of flat stock and are milled with a series of grooves which correspond to the thread to be rolled. In order to enable the work to enter the dies easily, each groove must be rounded at the end to a radius of approximately 5/32 inch. This rounded portion must blend smoothly with the rest of the groove, and to obtain this condition, the fixture shown in the illustration was designed.

This fixture consists chiefly of a work-holder B mounted in a base A. The base is of a channel cross-section, and is made from three flat pieces of steel fastened together by screws. The work-holder B is mounted in this channel on the pivots C, but is prevented from oscillating by the dowel-pin D, which is a slip fit in both the channel and the work-holder.

The die to be milled is placed in the holder B and secured by means of the three set-screws shown. The fixture is fastened to the table of the milling machine at an angle corresponding with that of the thread to be cut, and the grooves are cut, starting at the right of the fix-



Fixture in which the Work-holder is Oscillated to Round the End of Each Thread being Milled in a Thread Rolling Die

ture. When the cutter reaches a point directly over the pivots C, the pin D is removed; then by the application of a babbitt hammer, the projecting ends F of the holder are oscillated about the pivots C in the direction of the arrow. This oscillating movement of the holder causes the cutter to round the ends of the grooves.

To prevent the ends F of the holder from being raised when the pin D is removed, a stop-screw E is provided. This stop also facilitates lining up the holes in the holder and base for the pin D. The ends of the grooves can be rounded to various radii by locating pins C in the required positions.

Clearance holes are provided in the side of the base to facilitate the tightening of the clamping screws in the holder. These screws, of course, must enter the holder far enough for their heads to clear the base when the holder is oscillated. For locating the work in the proper relation to the pivot pins, a stop G is provided.

Piercing from Both Ends of a Hole

By C. W. HINMAN, Villa Park, Ill.

In manufacturing the piece shown at A, Fig. 1, trouble was experienced by the neck B rupturing along the edges while being formed. This was thought to be due to the crystallized edges left by the piercing punch, and to eliminate this condition, the die to be described was built.

From the plan view it will be seen that the blanking die and the die for piercing and indenting are two separate parts, the joint of the two dies being at the same angle as the inclination of the pieces that are blanked from the strips. This two-piece die construction was used for the sake of economy, the piercing die being made of cold-rolled steel with hardened tool-steel inserts. Tool steel was required for the inserts, as all the piercing and indenting operations are performed in this part of the die, and hence the inserts are subjected to hard usage.

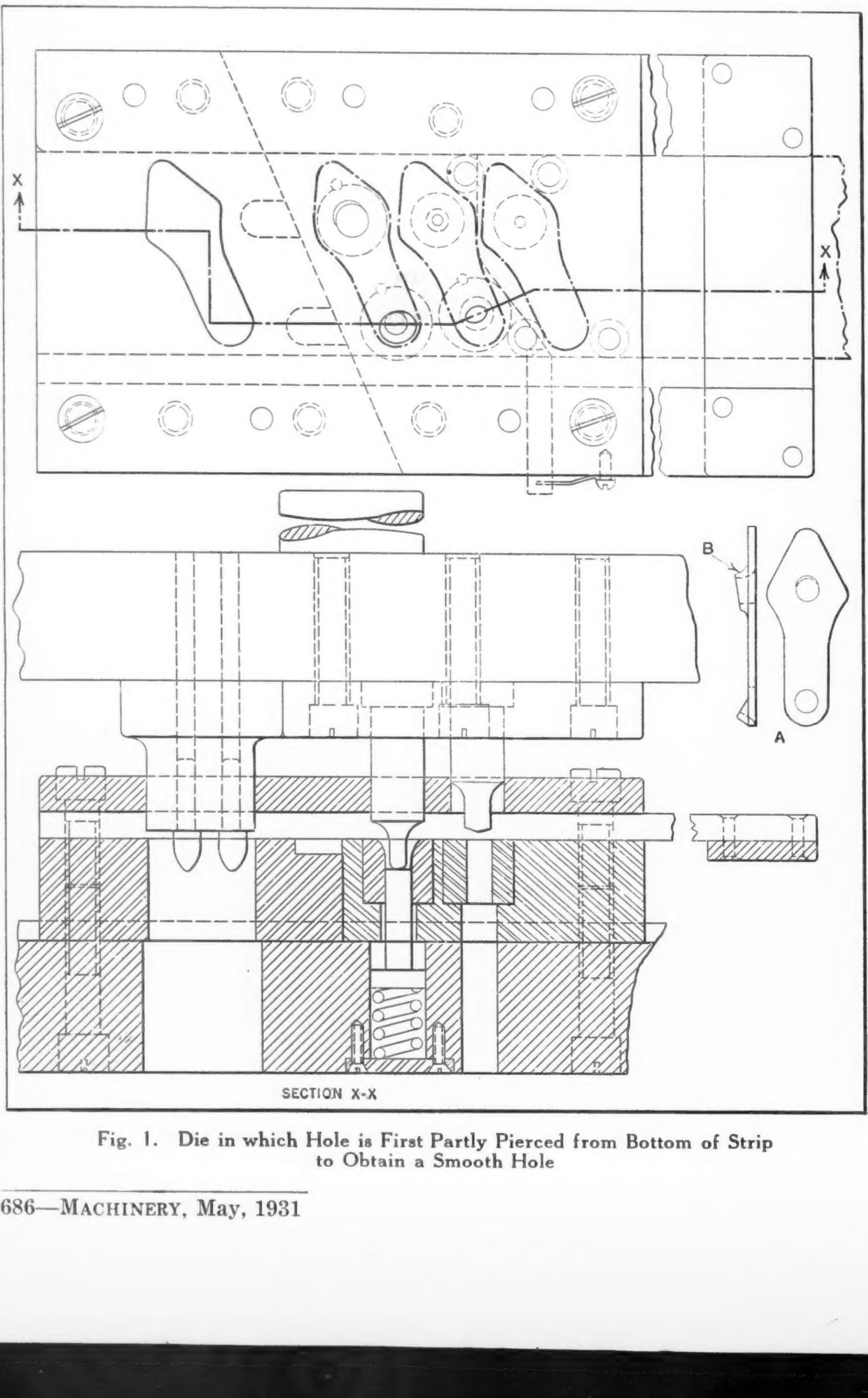


Fig. 1. Die in which Hole is First Partly Pierced from Bottom of Strip to Obtain a Smooth Hole

In operation, the strip, which has previously been sheared off at an angle at one end, is placed in the die against the finger-stop provided in the stripper plate. In the first step, two 5/16-inch pilot-holes are pierced, and one 0.177-inch hole is indented. The latter hole is indented to a depth of 3/64 inch by means of a punch operating from the under side of the stock.

This operation will be better understood from Fig. 2, where the indenting punch H is shown in position ready to enter the strip. The pad I removes the strip from the punch when the punch-holder ascends, while the flat punch J serves as an anvil for supporting the strip against the pressure of the indenting punch. The pad I is actuated by means of a coil spring inserted in a counterbore at the bottom of the die-bed.

In the second step, two pilot-pins enter the 5/16-inch holes pierced in the previous step and hold the strip in position while the small 0.177-inch hole is finish-pierced from the top of the stock. By first piercing from the bottom of the strip, it will be seen that a clean, unbroken

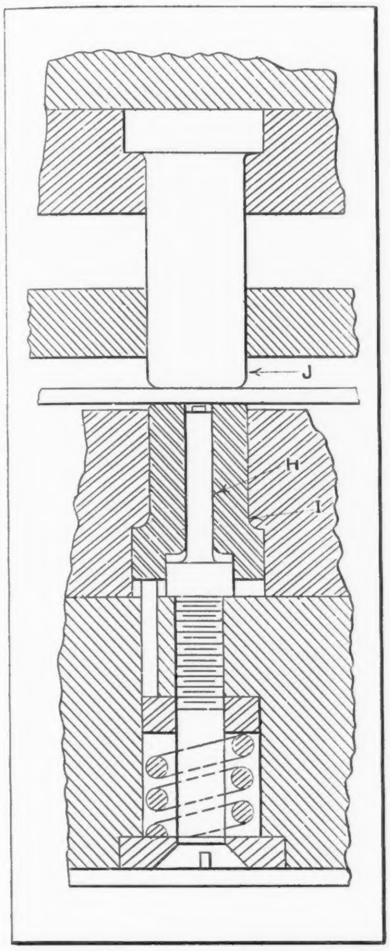


Fig. 2. Section of Die Illustrated in Fig. 1, Showing how Strip is Partly Pierced from the Bottom

hole free from crystallization or irregularity will result, so that when the forming punch stretches the metal to form the boss *B*, Fig. 1, on the work, an even draw will be obtained, with slight chance of the metal fracturing. In this step, an oval hole is also pierced at the small end of the blank.

In the next step, both bosses are formed, while in the fourth step no operation is performed, so that sufficient metal will be allowed around the hole in the blanking die. In the last step, the piece is blanked, after which it drops through the die. The blanking punch carries the usual pilot-pins to locate the strip for this operation.

Slotting in a Power Press

By WILLIAM C. BETZ, New Britain, Conn.

The milling fixture for slotting the brass disk described on page 281 of December MACHINERY should prove of value for small quantities. It is the writer's opinion, however, that for high production, a die, such as shown in the accompanying illustration, used in a power press, would be more economical.

In this die, the notching of the sides of the strip for the pilot-pins and the cutting of the two slots for the disk are done in the first step. The strip is next fed along, the pilot-pins locating the strip for the succeeding steps. At the third step, the blank is cut from the strip and, at the same time, the scrap is severed and slides down an incline at the end of the die.

If a roll feed is employed, the lever-stop shown may be omitted. Standard finger-stops, as shown, should be furnished in order to start each strip. In a die of this type, the bodies of the punches for slotting must be made of sufficient cross-section to prevent damage which may result from the extra thickness of the stock.

Is There a Difference in Oil?

By W. F. SCHAPHORST, Newark, N. J.

Some manufacturers seem to think that one lubricating oil is about as good as another. They are mistaken, however. The following letter from the manager of a large manufacturing concern indicates that he has found that there is a decided difference in the lubricating value of different oils. Quoting from his letter:

"Before using this new oil, we had to oil four bearings on this machine about every hour and a half. Since using the new oil we oil the machine only twice a day.

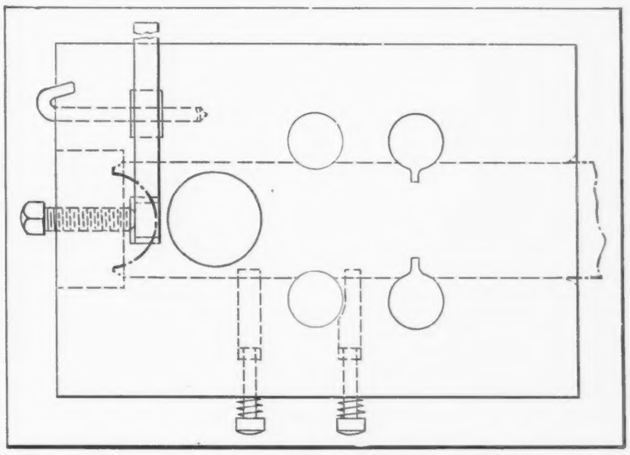
"We had one electric motor in which the bearings always became so hot that we sometimes had to stop it for a while to let it cool. Since using the new oil we fill the box about once a week and have never had a hot bearing.

"A small pump operated by power has a plunger-rod passing through the top of a cap. This rod would always squeak. Even when it was oiled every day it would squeak before night. Since using the new oil on this rod, about four months ago, we have never heard it squeak."

* * *

Steel Treaters' Meeting in Hartford

A New England sectional meeting of the American Society for Steel Treating was held in Hartford, Conn., April 14. A diversified technical program had been planned. E. W. Page of the General Electric X-Ray Corporation, Chicago, Ill., read a paper on "The X-ray in the Metal Industry." Dr. Victor O. Homerberg, technical director, Nitralloy Corporation, and formerly associate professor of physical metallurgy, Massachusetts Institute of Technology, Cambridge, Mass., read a paper entitled "Recent Developments in Nitriding." Dr. Zay Jeffries, consulting metallurgist for the General Electric Co. and the Aluminum Co. of America, spoke on "The Metallurgist in Industry." Local plants, including the Pratt & Whitney Co. and the Pratt & Whitney Aircraft Co., were visited.



Plan View of Die for Slotting Disks which were Formerly Milled

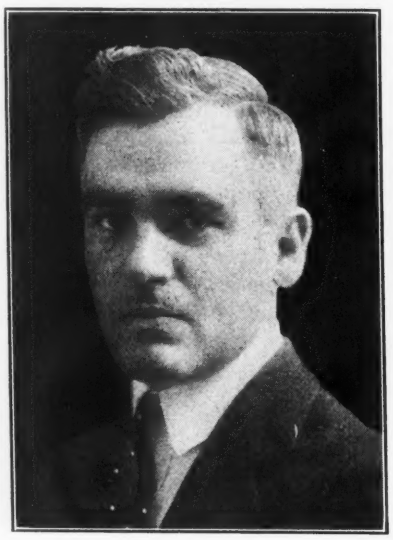
Training Draftsmen in a Trade School

How the Dunwoody Industrial Institute of Minneapolis Has Arranged its Course in Mechanical Drawing and Machine Design to Meet the Practical Needs of Industry

By WILLIAM B. GROTHEN

THERE has been a great deal of criticism of the methods used by engineering and trade schools in teaching mechanical drawing and machine design. Men engaged directly in the industries have felt that the training in the schools has not been such as to fit the student for practical work.

To meet these criticisms, the Dunwoody Industrial Institute, of Minneapolis, Minn., laid down certain rules governing the training to be given in drawing and machine design. The following objects were sought: To train the students in the school under conditions that would approximate as close as possible those met with in industry; to develop such skill and habits of work as are required for successful industrial work; to teach those subjects that would have a direct application in industry; and to train the student in the use of accepted industrial standards.



William B. Grothen

The required training was analyzed and divided into three objectives: (1) To develop skill in the mechanical performance of the work; (2) to impart such knowledge as would be directly applicable in industrial work; and (3) to impart such auxiliary knowledge and training as is necessary for successful employment and advancement in the chosen work of the student.

Under the heading of skill, it was decided that the successful draftsman should be able to (1) letter rapidly and neatly; (2) use drafting instruments and measuring devices properly and give all necessary information on the drawing where it may be easily found—this should be done with a minimum number of views, so as to reduce labor and expense; (3) make a shop sketch neatly and rapidly, giving all the necessary information so that another man, or the draftsman himself, can make a complete drawing from the sketch; (4) check a drawing made by someone else so as to catch all errors in dimensioning, fits, tolerances, and relationship of parts.

Under the heading of knowledge directly applicable in industrial work were included mathematics, mainly the use of formulas and trigonometry; mechanics, especially mathematical and graphical solutions of static and moving forces; strength of materials, including a knowledge of the characteristics of different metals; and a study of standard machine parts, such as bolts, nuts, keys, keyways, clutches, couplings, pulleys, belting, gears, cams, etc., as well as screw thread systems, tapers, fits, and tolerances.

Under the third heading—auxiliary knowledge and trade information—the prospective draftsman and designer should receive instruction in machining operations and in the general design and construction of standard machine tools. Tooling for turret lathes and automatic screw machines should be given special attention. The subjects of pattern-making, molding, drop-forging, and die-casting must also be included. Tool- and die-making is especially important in this connection. A general course covering prime movers, electric control apparatus, materials handling equipment, plant lay-outs, and factory systems should also be given.

It is apparent that the instruction for draftsmen must lean toward the technical side and develop habits of thinking and analyzing. The students must be taught how to secure information and how to use it after it is found. The practical side, however, must not be neglected, and actual shop instruction in the subjects mentioned must also be given.

Teaching the Technique of Drafting and Lettering

The method commonly used in teaching lettering is to keep the student working on practice plates until he develops fair speed in good lettering. This method has a tendency to discourage the learner, and defeats its own object, because the work becomes tiresome and lacks the stimulus of interest. At the Dunwoody Institute, therefore, the learners are given only one preliminary practice sheet of lettering. Skill is developed by requiring the student to keep a notebook in which all notes must be lettered. The instructor checks the notes from time to time and also calls attention to errors in lettering on drawings. Notebook paper with guide lines is provided, which facilitates the lettering of the notes.

WILLIAM B. GROTHEN, after graduating from high school, first worked in the machine shop and then in the drafting-room of a tractor manufacturing concern. Later he engaged in the design of industrial oil-burning equipment. He has also had experience in machine tool design. He completed his education by university studies in the engineering and educational departments, and, for the last eleven years, has been teaching shop drawing, mechanical drawing, and machine design at the Dunwoody Industrial Institute, Minneapolis, Minn.

The process of teaching a learner how to make drawings includes a graded set of problems. All drawings are made from actual machine parts. The student is required to make, first, a dimensioned sketch from the part, and then a finished drawing, taking all the information from his own sketch. The part to be drawn should not be available to him after the sketch is completed. This develops the habit of giving all the necessary information on the sketch.

Drawing cannot be learned by copying. A draftsman may learn to make a neat drawing in this way, but he exercises no original thought, and does not know why things are shown as they are. Such instruction gives him very little that he can apply later to a particular job.

It is the writer's belief that to teach drawing technique by means of geometric exercises is a waste of time in training a draftsman for industrial work. The small amount of geometric construction required by the average draftsman can be taught more efficiently as applied to practical jobs. The main reason why this form of instruction survives is that geometric exercise drawing is easy to teach, it requires no practical experience on the part of the teacher, and countless text-books are available to save the instructor from doing individual work. Should a draftsman encounter a geometric problem, he usually has MACHINERY'S HANDBOOK or some other reference book available, which will give him the required information.

Training in Accuracy Obtained by Checking Drawings

The students are required to check each other's drawings, and the checker is graded according to the accuracy with which this work is done. The checking of drawings develops the student's ability fully as much as the actual drawing. Checking is also a duty that often falls to the draftsman in smaller industrial drafting-rooms.

All training is given under conditions approximating as close as possible those of a drafting-room in an industrial plant. The standards are kept high and no work is accepted that would not meet industrial requirements. At first, of course, minor errors are excusable, but as the student progresses, the instructors become more and more rigid, and after he has made ten or twelve drawings, they are expected to be as complete and accurate as if they were to go into a regular shop.

The training in mathematics is given by the use of practical problems of a type that the student is likely to encounter when he begins to work. Abstract exercise problems may be suitable for training the mind, but the resourceful instructor can find many problems that apply directly in practice. This will increase the students' interest and will help them to progress more rapidly. The same is true in mechanics and strength of materials.

The instructor always requires the students to use standard parts or to conform to adopted industrial standards. The instruction also includes training in the use of standard reference books and handbooks, including MACHINERY'S HANDBOOK, Kent's, Mark's, and the *American Machinist* Handbook. MACHINERY'S HANDBOOK is used as a text by the Institute, and definite lessons are assigned, the instructor devising problems to give practice in its use.

Machine Shop Practice Instruction

The course in machine shop practice is so planned as to give experience on as many types of machines as possible. If a new or unusual job is to be handled in any part of the machine shop, all the students are brought to see it, and it is explained to them. They are expected to make models and castings from a few patterns, so as to learn something of the problems confronting the patternmaker and molder. Visits are made to plants where drop-forgings and die-castings are made.

The design, making, and use of punches, dies, jigs, and fixtures are emphasized in the course. It is not expected that the students should become skilled mechanics in any of the trades mentioned, because time would not permit the mastery of even one. But knowledge of machine shop methods is absolutely necessary as a foundation for intelligent work as a draftsman and designer. No student knows exactly what type of work he will do after leaving school, and he ought to have a general knowledge of many fields.

Briefly stated, the idea upon which the courses of the Dunwoody Institute have been built is that an educated man is one who knows where to obtain the facts that he needs and how to use them after he has obtained them.

* * *

Production Meeting of Automotive Engineers

The production division of the Society of Automotive Engineers, in conjunction with the Milwaukee section of the Society, will hold a spring production meeting in Milwaukee, Wis., Thursday and Friday, May 7 and 8. Among the papers to be presented are the following: "The Use of Power Driven Industrial Trucks in the Handling Systems of Automotive Plants." This paper will be presented by C. B. Crockett of the Industrial Truck Association. T. H. Wickenden of the International Nickel Co., will present a paper on nickel alloys in automotive manufacturing, dealing with the use of nickel particularly in engine parts, such as cylinder blocks and pistons, and in production equipment, such as die-blocks. He will also deal with nickel alloy foundry practice and the machineability of nickel alloys.

"New Developments in Surface Hardening of Steel and Their Effect on Cost of Production" will be the subject of a paper presented by H. E. Koch of the Hevi-Duty Electric Co. F. W. Curtis of the Kearney & Trecker Corporation will read a paper "Latest Developments in High-speed Milling with Tantalum-carbide and Tungsten-carbide Cutters."

Ideas for the Shop and Drafting-room

Time- and Labor-saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

When Dimensions Are Not to Scale

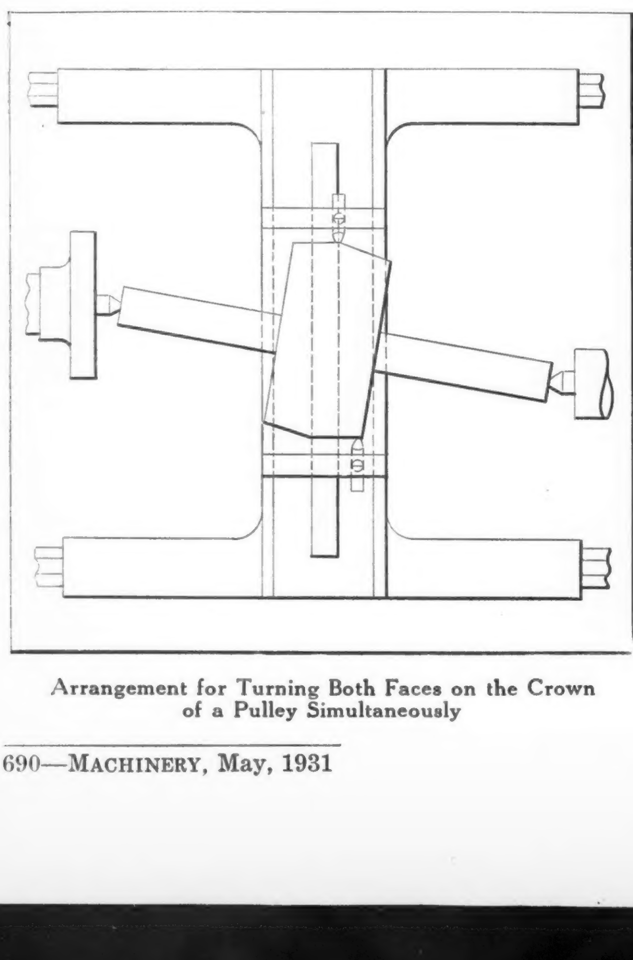
Sometimes dimensions on a drawing are not made to scale, and in such cases, it is good practice to underscore all dimensions that are out of scale. Then when anyone using the drawing notes an underlined dimension, he will know immediately that it is not expected to measure accurately to scale. This avoids confusion on the part of everyone who has to make use of the drawing.

Cincinnati, Ohio J. A. ELSBERND

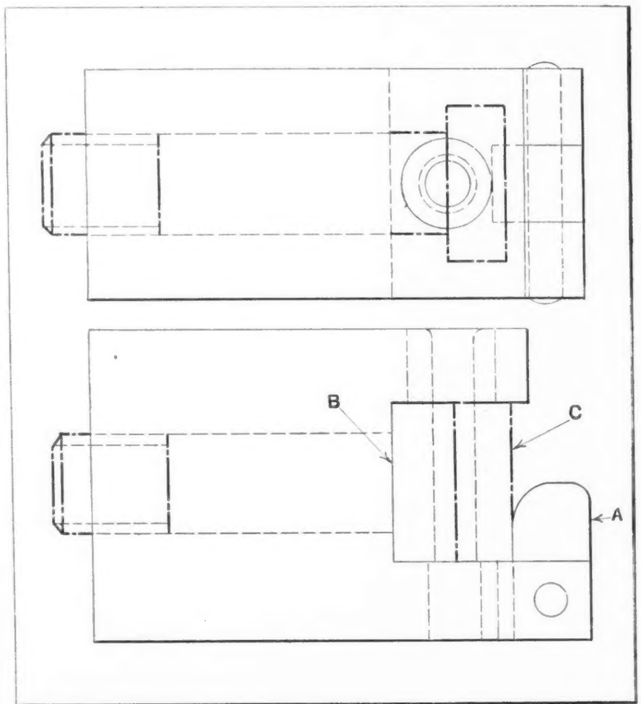
Pulley Crowning Attachment for Engine Lathes

Both faces of the crown on cast-iron pulleys are turned simultaneously with the arrangement shown diagrammatically in the illustration. The work is done in an engine lathe in which the standard cross-slide is replaced by a special dovetailed block for holding the two cutting tools. The work is secured on an arbor which, in turn, is supported between the lathe centers. The tailstock is thrown over an amount corresponding with the crown angle. The block is then clamped in position on the carriage and the tools are set to the required depth. It is obvious that every pulley must be set in the same position on the arbor; otherwise, the depth of the cut would vary.

Philadelphia, Pa. CHARLES KUGLER



Arrangement for Turning Both Faces on the Crown of a Pulley Simultaneously



Jig in which Leaf is Locked by Contact with the Drilling Machine Table

Drill Jig with Simple Locking Device

A simple jig employed for drilling cross-holes through square-head bolts is shown in the illustration. The head of the bolt is located against its seat in the jig by means of the locking leaf *A*. This leaf is pivoted in the lower part of the jig, so that it can be swung outward for loading.

As indicated, the work is locked in position, and when the jig is placed on the table of the drilling machine, the flat end of the locking leaf also rests on the table so that it cannot swing out of position. With this construction, the jig must be lifted from the table in order to release the leaf. It is obvious that the surfaces *B* and *C* must be finished when the bolts are drilled in this jig, as very little clearance is allowed between surface *C* and the leaf when the latter is in the locked position.

Cleveland, Ohio W. N. DELENK

Indicating Finish for Flat Surfaces

The writer believes that too little attention is given to indicating finish on drawings. Tolerances are often given, and in such cases, it is generally assumed that a "smooth" finish is required. The finish for bores is usually indicated by the words "drill," "ream," or "grind."

For flat surfaces, however, especially castings, the only indication is the symbol "f"; usually the only practical value of this symbol is to indicate to the patternmaker that an allowance must be made for machining. The man who does the machining knows that the surface so marked must be machined to dimensions, but he has no way of knowing whether it should be "hogged off" or brought to a smooth finish. Hence, waste of time or an unsatisfactory finish may be the result.

The writer uses the symbol "f" to indicate rough machine finish, "ff" to indicate smooth machine finish, "gf" to indicate ground finish, and "pf" to indicate polished finish.

Philadelphia, Pa. R. H. KASPER

Simple Change in Bending Die Increases Production

In Fig. 1 is shown the bending die originally used in the manufacture of a small part *A* for the dash ammeter of the Model A Ford. The blank *B* for this part, which is known as the "movement support," is placed on the die around the locating or guide pins *C*, with the tongue *E* against the stop *D*. On the downward stroke of the punch *F*, the tongue is bent to the shape shown at *G*. When this die was used, the workman was paid at the rate of 5 1/2 cents per hundred for the job.

By removing the pins *C* and stop *D* and providing a back guide strip *H*, such as shown in Fig. 2, and a wider forming punch *J* to facilitate locating the work, the production was increased so much that the rate was reduced to 4 cents per hundred. This may seem like a small item, but when the production runs into many hundred thousands of parts, it represents a considerable saving at the end of a year.

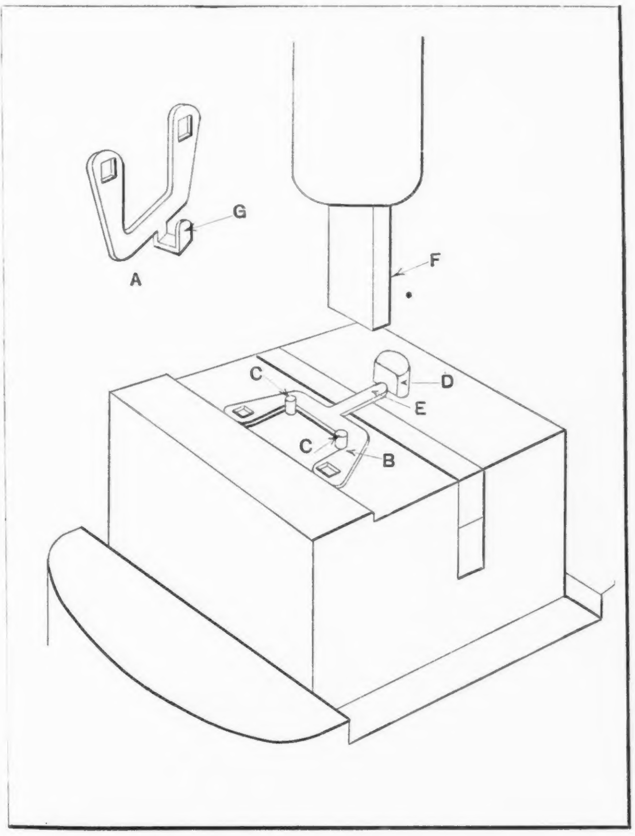


Fig. 1. Die Originally Used for Bending Tongue E to Shape Shown at G

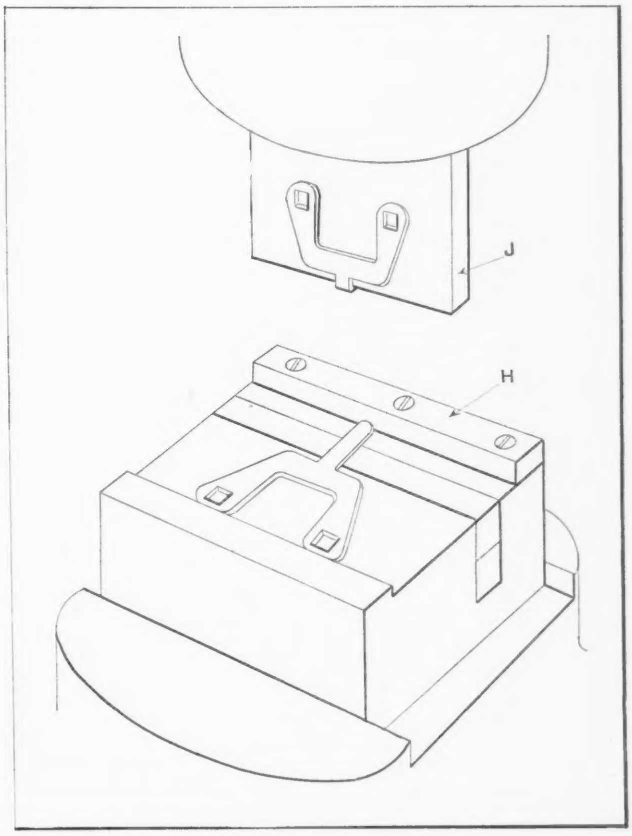


Fig. 2. Die Shown in Fig. 1 after Changing Locating Means to Facilitate Operation

Concord, N. H. CHARLES H. WILLEY

The Engineer's Own Data Book

Commenting on the suggestion made on page 445 of February MACHINERY, the writer would like to record the methods used by three tool engineers whose principal work consists in designing production tooling equipment. They cut out from the technical journals for which they subscribe the illustrations of jigs, dies, and fixtures, and paste them in a loose-leaf book, indexing them in such a manner that the class of tools as a whole can be easily found. One section, for example, will be devoted to bending dies. When a bending fixture is required, that section will be referred to, and the writer has been told that, in nine cases out of ten, these designers are able to get an idea from the designs on record that is directly applicable to the job in hand.

If tool engineers, instead of merely glancing over the pages of a publication, would cut out and classify the different kinds of tools described, they would frequently be able to cut in half the time required for designing jigs, dies, and fixtures.

Boston, Mass. CHARLES R. WHITEHOUSE

Countersunk Rivets for Sheet Metal

An Outline of the De Bergue Riveting Process

By A. EYLES

THE riveting of sheet-metal joints has been practiced for many centuries and, without doubt, will be employed in sheet-metal work for a long time to come. Not infrequently it is necessary to perform hand-riveting operations on sheet-metal products because a power riveter is not available or because the joint to be riveted is not accessible. Although primarily designed for metal aircraft construction, the De Bergue patent riveting process, briefly described here, is well adapted for general use in the sheet-metal manufacturing industry for the fabrication of products in which sheet metal up to about 1/8 inch in thickness is employed.

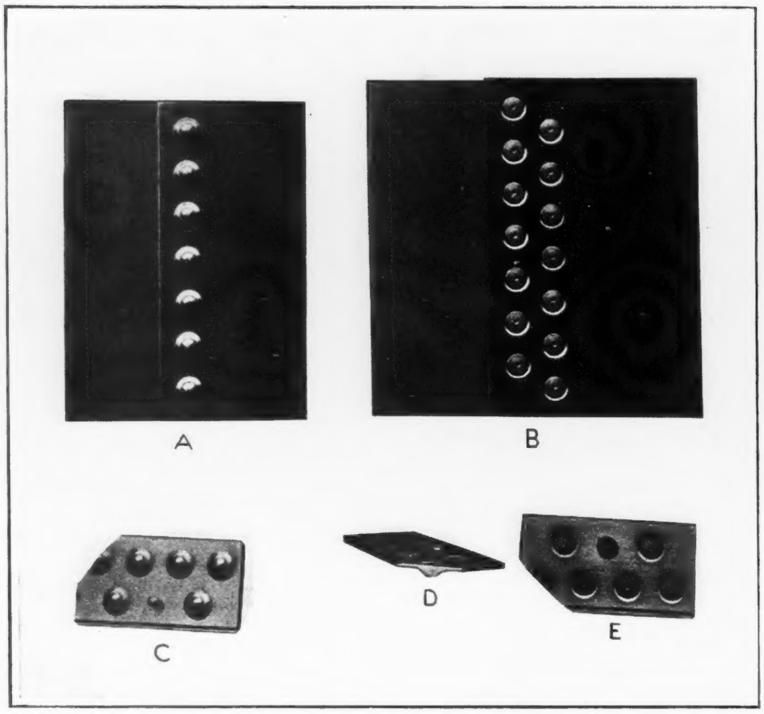


Fig. 1. Examples of Sheet Metal Joints Made by Countersunk Riveting Process which Leaves Joint Flat on One Side

In Fig. 1 are shown several joints in stainless steel sheets which have been riveted by the De Bergue process. These sheets are of No. 20 gage (0.05 inch thick) with rivets 5/32 inch in diameter. The riveting operation is performed in one quick squeezing action on a small pneumatic riveting machine. The time required for this operation is about the same as that for light machine riveting, using rivets of the ordinary type. A cross-section of a riveted joint is shown in Fig. 2. At *A*, Fig. 1, is shown the reverse face of a single-riveted lap joint, and at *B* is illustrated the flat face of a double-riveted lap joint. The views *C*, *D*, and *E* show three joints arranged in different positions in order to illustrate the process. In each of these joints, one rivet has been left in the hole ready for heading, the holes for which are drilled or punched in the ordinary way.

In the joint at *D* may be seen the flat head of a rivet before it has been subjected to the riveting operation. It will be observed that this head projects above the sheet surface in the shape of a portion cut from the base of a cone. The projecting end or shank of one of the rivets before the heading operation is performed may be seen in the joint at *C*. The process of riveting consists of placing the rivet through the hole in the sheets with the flat head in contact with the bottom riveting tool. The top riveting tool, which is specially shaped on its face, descends over the projecting end of the rivet, and with one quick squeezing action, forces the flat rivet head into the two sheets, forming them to a cup shape with the flat head of the rivet flush with the surface of the sheet. This leaves one side of the joint flat without any portion of the rivet projecting.

While this is taking place, a new cup-shaped head is formed on the rivet shank by a cupped depression in the top riveting tool. Inspection of the corner section at *D*, where a cut has been taken through the center of a rivet, shows that the two sheets are nested together and held securely by the rivet as one solid mass.

As the sheets are interlocked, they cannot slide, the shearing stress being taken entirely from the rivet shanks and placed on the cupped depressions formed in the sheets themselves. This gives a joint having lasting rigidity and one that is claimed to have twice the strength of a joint made with ordinary rivets.

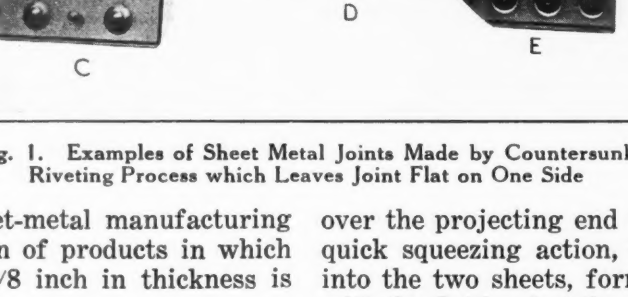


Fig. 2. Cross-section through Countersunk Rivet and Metal Sheets

The method of riveting described has been applied to aluminum, brass, copper, duralumin, monel metal, nickel, nickel-chromium iron, stainless steel, and mild steel.

Milling Around Obstructions

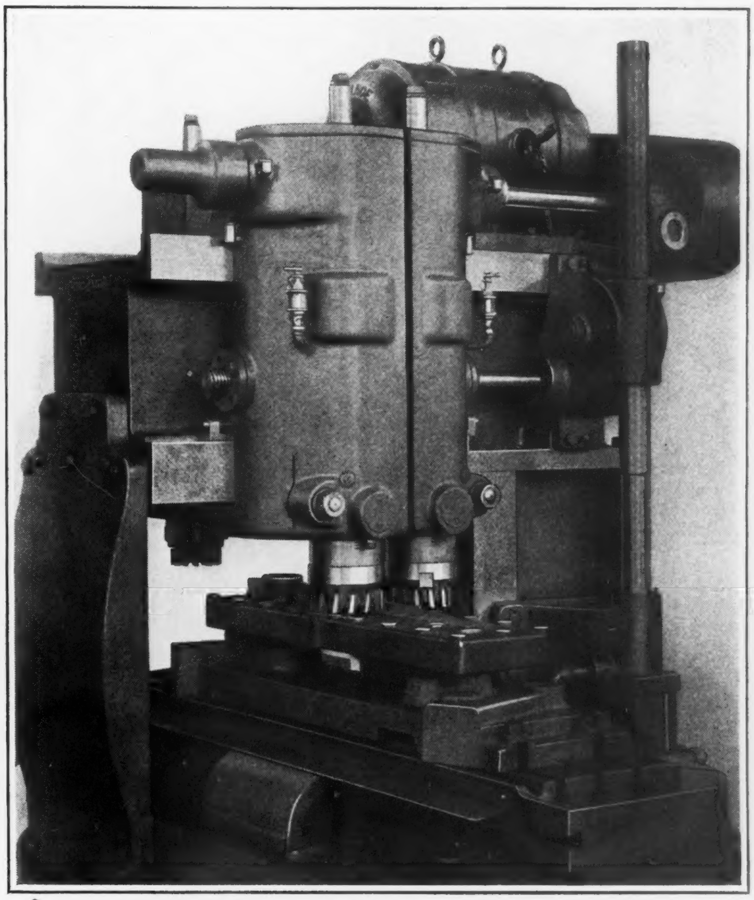


Fig. 2. The Lateral Movements of the Spindle-carriers Automatically Guide the Cutters around the Obstructing Flange of the Cylinder Head Shown in Fig. 1

A PRODUCTION milling machine is not generally called upon to dodge around obstructions; and yet, in milling parts like the cylinder heads shown in Fig. 1 on a production basis, it is called upon to do just that. This job consists of milling the bolt bosses and water inlet flange. The inlet flange is higher than the bolt bosses and swells outward between the bosses in such a way as to obstruct the normal travel of a milling cutter.

This difficulty was overcome by mounting a pair of sliding carriers equipped with quill-adjusted spindles on a Cincinnati Hydromatic milling machine, as shown in Fig. 2. The carriers are operated hydraulically and guide the cutters automatically around the obstructing flange. They are close together while the first pair of bolt bosses is being milled. Then, to prevent the cutters from striking the water inlet flange, the carriers move apart just enough to clear the flange, after which they move together again in order to complete the remaining bolt bosses.

At the end of the cut, the carriers are drawn apart and the work is returned to the starting position by the rapid traverse. However, just before the table reaches the end of its return movement, the carriers move together once more. The path of the cutters during the entire cycle is clearly shown by heavy dot-and-dash lines in Fig. 1. All feeding movements during the cycle are entirely automatic. The operator simply loads the work and shifts the lever that starts the feed, after which he is free to prepare the next piece for loading.

It is interesting to note how the apparently complicated feeding movements are obtained. The table goes through the regular cycle of movements —rapid advance, mill, rapid return, and stop. Referring to Fig. 2, the spindle-carriers are moved in and out by means of a right- and left-hand screw

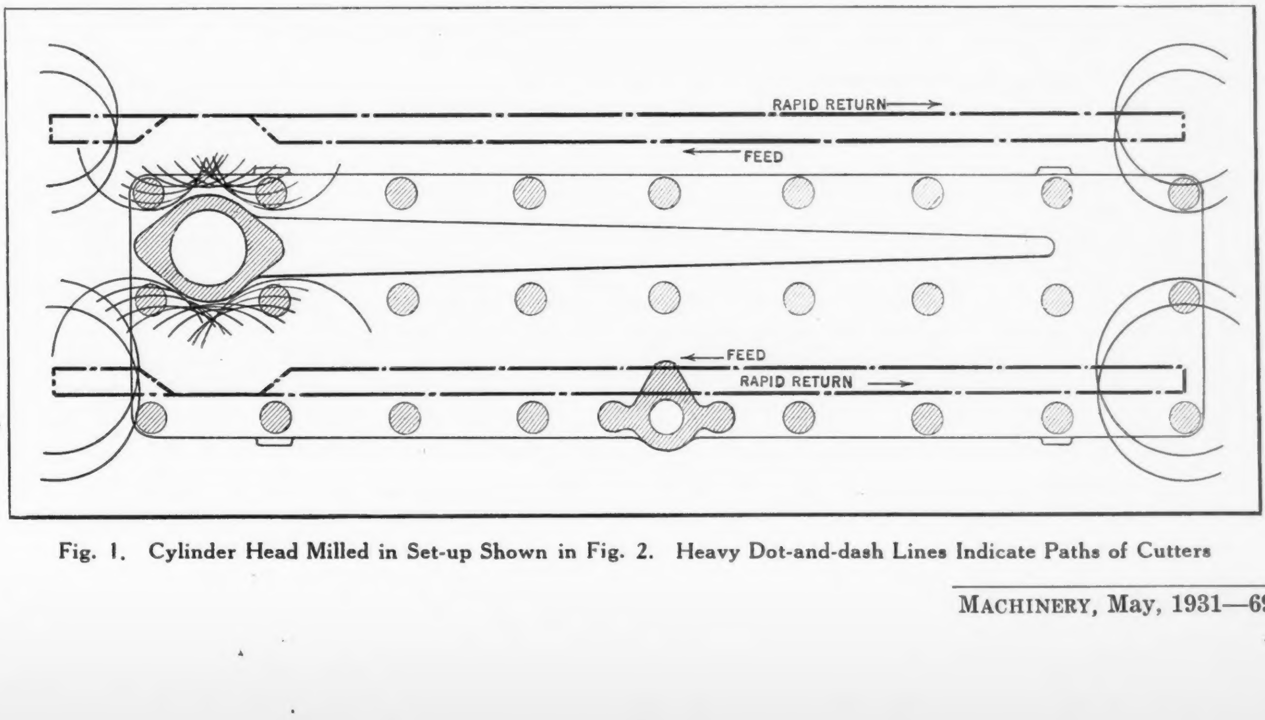


Fig. 1. Cylinder Head Milled in Set-up Shown in Fig. 2. Heavy Dot-and-dash Lines Indicate Paths of Cutters

on the end of a horizontal shaft. This shaft is rotated from the long vertical shaft.

At the rear of the table are mounted control dogs operating a valve that admits oil under pressure to a cylinder at the lower end of the vertical shaft. The full stroke of the piston, which is secured to the end of the shaft, is just enough to move the spindle-carriers the correct distance apart, the dogs being set so that the stroke is correctly timed relative to the table movement.

A third spindle-carrier, which is fixed, is mounted on the opposite side of the rail. The cutter mounted on the spindle of this carrier mills the top of the water inlet flange as the flange passes by. The spindle of this carrier is also provided with a quill for obtaining vertical adjustment of the cutter. Obviously, no extra time is required for this added operation. The table feed used for this job is 24 inches per minute, with a rapid traverse of 300 inches per minute.

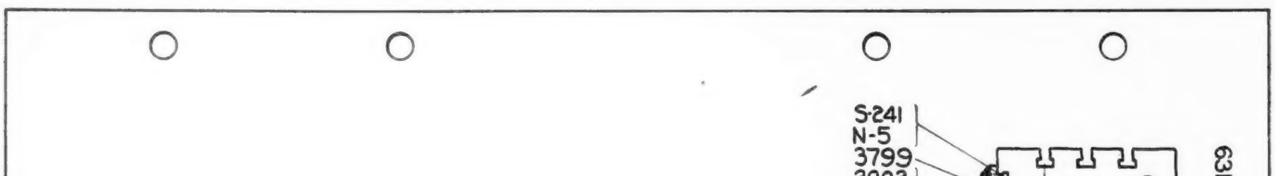
List of Repair Parts in Booklet Form

Simple Method of Making a List of Machine Parts, which Facilitates Identifying Every Part and Prevents Errors in Ordering Replacements

By E. H. BRUCE, Engineering Department
Kearney & Trecker Corporation
Milwaukee, Wis.

A MACHINE tool may be of excellent design and construction, yet to the foreman of the repair department, it will not be complete without its repair parts list. Such a list, in booklet form, will be of value, not only as an aid in ordering repair parts and as a means of cultivating the good will of those responsible for the maintenance of equipment, but also as a form of advertising. The list must, of course, be accurate and should originate in the engineering department.

With these facts in mind, the engineering department of the Kearney & Trecker Corporation selected the simple and effective type of list described in this article for the Milwaukee milling machines, of which they are the manufacturers. These machines are manufactured in units, and the same unit idea was carried out in compiling the repair parts list. The first step was to retrace, "freehand," the full-size assembly drawings, using a lettering pen that made a line sufficiently wide to



Example of Assembly Sheet Used with Repair Parts List

be clearly seen on the drawings when reduced to 8 1/2 by 11 inches.

Part numbers were printed on the assembly drawings, with leader lines running to the corresponding parts, as shown in the accompanying illustration. Each unit drawing was carefully checked, both with the manufacturing master list and the detail drawings. Unit lists, corresponding to the unit assembly drawings, were also typed. On these lists, all the small stock parts, such as screws, nuts, taper pins, dowels, etc., which in many cases are not shown on the drawings, were grouped with the major parts. For example, the unit list headed "Repair Parts List for Universal Table and Saddle —Unit Assembly No. 631 (Knee Type)" has as its first item "Standard Table" at the left, with the corresponding number 3775 to the right. Under the item "Standard Table—3775" are listed all the small parts, together with their numbers, that are included with it.

To facilitate finding the desired unit number, index sheets, giving the unit numbers and their names in numerical order, were typed. On the first of these sheets is given the following information:

"This Repair Parts List was made up to help you when ordering repair parts. With each unit assembly line drawing showing part numbers, there is a complete list giving the name of each part, together with its included stock parts. When ordering parts, care must be taken in selecting the part number, and in all cases, the unit assembly number, size of machine, and correct lot number of machine should be given. This information will be found stamped on the finished surface on the front of the knee."

Another sheet entitled "How to Order Parts for Milwaukee Knee Type Milling Machines" gives the following instructions: "It is our earnest desire to assist you in keeping your Milwaukee Milling Machines in constant operating condition. To assure efficient handling of your order and prompt shipment of the *correct* repair parts for your milling machine, please give us complete information as follows: (1) Name of part; (2) number of part; (3) number of unit in which part is located; and (4) serial number of machine for which part is needed.

"For example: Suppose you wish to replace the gear in the speed segment in the column. First, look through the index and obtain the unit assembly number of the column, which is 641. Then turn to the assembly drawing 641-2 and pick out the gear on the drawing. Follow the line down to its number, which is 3039. Then turn to the tabular list of parts for unit 641 and obtain the name of the part—'Cone Gear.' Next, ascertain the serial number of the machine. It is stamped on the front of the knee of the machine and also on the face of the column under the double over-arms.

"With this information, your order, whether it be by letter or telegram, should read as follows: 'Rush via (parcel post, express, or freight) one No. 3039 Cone Gear, Serial number . . . . .' If you order by mail, insure against possible mistake by adding information that the gear has three steps of 24, 29, and 35 teeth of 9 pitch and includes a 3040 bushing. Please follow these instructions carefully, and you will receive the best possible service."

The tracings and typewritten lists described were printed by the inexpensive planograph process, which eliminates any possibility of typographical errors. In binding the sheets, the drawings were inserted directly after the corresponding list, and the list sheets were cut 1/2 inch narrower so that the unit numbers at the right-hand edges of the drawing sheets are visible and easier to find. For the booklet cover, a good durable stock, preferably of a dark shade, should be used. This cover should be capable of withstanding hard usage, and may be made as attractive as desired. A booklet such as described is now being forwarded with each order for a machine or machines.

The Cleveland Industrial Congress and Exposition

In connection with the Second National Industrial Equipment Exposition held in the Public Auditorium, Cleveland, Ohio, April 13 to 17, a National Industrial Congress dealing with management, maintenance, and materials handling problems was staged under the auspices of a number of engineering societies, including the American Society of Mechanical Engineers, the American Management Association, the Society of Industrial Engineers, and the Cleveland Engineering Society. The present interest in better management and better materials handling methods made the meeting one of especial importance in the engineering field.

The program of technical papers was unusually diversified. Not less than forty-five papers were presented dealing with waste elimination; scrap handling; application of hoists, monorails, and conveyors; trucking and shipping; maintenance engineering; and general problems in materials handling and plant management. A specialized branch of management that has not received much attention in the past—the management of drafting-rooms—was accorded a special session at which two excellent papers on the subject were read.

The Industrial Exposition, held in conjunction with the meeting, permitted a close study of the latest developments in materials handling and maintenance equipment. Among the educational exhibits included should be mentioned those arranged by the Elimination of Waste Committee, which consisted of examples of waste exhibit boards that are being used as part of a national waste elimination campaign.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

H. M. D.—The writer read with interest the article "Gray Finish for Tools" in a previous number of MACHINERY, and would like to know if any user of a pickling acid such as described has had trouble from the fracturing of hardened tools so treated. A manufacturer of round threading dies of the kind shown in the illustration experienced trouble from the cracking of the dies at *A*.

Ordinarily, these dies are made from tool-steel drop-forgings, but some were forged from low-carbon steel having a carbon content of 0.035 per cent. These low-carbon forgings were carburized to a depth of 1/32 inch and hardened. The acid pickling was applied to remove scale previous to cadmium plating. When pickled and plated, the dies made from low-carbon steel broke as easily as those made of high-carbon steel. None of the broken dies showed hardening cracks, but seemed to simply fall apart. Dies in the same lot, which were handled in an identical manner, but which were not pickled, did not fracture.

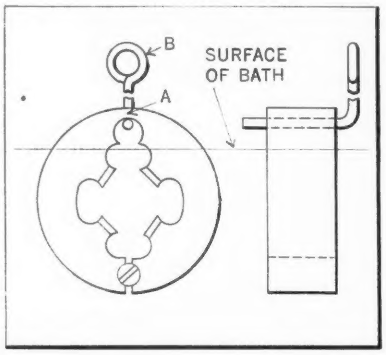
The plating company claims that the acid pickling solution causes the steel to become brittle and that the electrolytic and chemical actions of the cadmium plating solution set up strains in the steel that are likely to cause fractures. These fractures may not appear, however, until months after the pieces have been plated. Apparently, there is some action on the steel that is not clearly understood. The plating company mentions the fact that the plating solution is high in cyanide, which may be partly responsible for its action on the steel.

Answered by R. A. Dressler, Chief Engineer
Millersburg Reamer & Tool Co., Millersburg, Pa.

The writer has used the gray finishing process on such tools as reamers, cutters, end-mills, and drills, which subsequently have their cutting edges ground keen and to size, and where any eating away and loss in size due to the acid will not affect the finished product. The only bad effect ever attributed to the pickling acid has been the eating away of the sharp corners and edges so that there was not a sufficient allowance for grinding to size. The writer does not think it advisable to gray-finish threading tools, however, unless the thread form is afterward ground, which would be impracticable in the case of ordinary round threading dies.

A theory has been advanced that the acid will cause temporary brittleness, although it is difficult for the writer to see how this could happen, unless the acid penetrated to the center of the section *A*, which is highly improbable. It seems more likely that the section is too hard at the time of pickling and that a sudden rise in temperature caused by the action of the acid on the metal might fracture the die at this point. A change in the method of hardening and tempering might remedy the trouble.

One concern with which the writer was connected for some years hardened dies all over by quenching them at a temperature of 1460 degrees F. in brine, and then drew the temper at the spring section *A* in a lead bath held at a temperature of 1390 degrees F. This temperature may seem high, but it was used in order to obtain a high spot heat in a few seconds at point *A* without danger of affecting the cutting edges. Fair results were obtained by this method, but there were, nevertheless, frequent failures.



Method of Quenching Round Dies

A much better practice than that described is employed by a concern that has been engaged in the manufacture of threading tools for over fifty years. In this case, the dies are made from Firth-Sterling steel. The dies are heated to a temperature of 1420 degrees F. and quenched in brine, the gage test of the brine being 25 to 30. If a gage is not available for gaging the specific gravity of the brine, salt should be added to the water till it floats a potato. The die is not quenched all over, however, a wire *B* being bent and passed through the spring hole, as shown in the illustration, to hold the work while it is moved back and forth gently in the bath. This causes the brine to pass through the opening and thoroughly quench the cutting jaws.

The portion *A*, however, should remain above the surface of the bath, and the movement back and forth must not be so rapid as to cause the brine to rush over the top and harden it. When the exposed portion is still at a red heat, the die is transferred to the oil and permitted to cool off. This method will not cause excessive hardness at the section *A*. After this treatment, the dies are oil-tempered at 420 degrees F. for ten minutes or drawn in molten salts at 420 degrees F. for five minutes. The tool hardeners in the plant where this method is used claim that they obtain perfect dies without any loss due to cracking. If this method of hardening and tempering does not remedy the trouble, and it is really caused by the acid, paraffin should be melted

and painted on the portion *A* with a small brush before the work is placed in the pickling acid. The acid will not penetrate the paraffin, and will leave the steel beneath unaffected.

Amount of Reduction in Deep Drawing

A. S. D.—The writer is interested in obtaining data on the amount of reduction obtainable, per operation, in drawing deep shells from different metals, such as steel, brass, copper, and aluminum, in thicknesses from about No. 12 to No. 30 B. & S. gage. Also, any information on the design of special dies for drawing deep shells from blanks up to 10 or 12 inches in diameter, in the different metals mentioned, will be greatly appreciated.

A.—Assume that combination drawing dies are to be employed in a press equipped with spring or rubber buffers. An idea of the reduction in diameter and the increase in length possible in drawing deep shells of various sizes from different metals will be obtained from the accompanying table. This table has been prepared from information collected from many sources, based on records taken from actual practice. In some cases, the table includes the thickness of the metal after each operation. Thus, the fourth operation on No. 21 gage brass reduces the metal to No. 22 gage.

Change in Shell Dimensions Produced by Successive Drawing Operations

	First Operation	Second Operation	Third Operation	Fourth Operation	Fifth Operation	Sixth Operation	Seventh Operation	Eighth Operation	Ninth Operation
	Steel No. 21 U. S. Standard Gage—Diameter of Blank 6.16 Inches								
Diameter...	4 1/4	3 1/4	2 1/2	2 3/16	1 7/8	1 5/8	1 3/8	1 1/8	0.920
Height.....	1 5/16	2 3/8	3 1/2	4 1/8	5	5 5/8	6 1/2	8 1/4	10
	Steel No. 14 U. S. Standard Gage—Diameter of Blank 6 7/8 Inches								
Diameter...	4 1/4	3 1/16	2 1/2	2 1/4	2	1 7/8	.....	.....	.....
Height.....	1 5/8	3 1/4	4 1/16	4 1/4	4 3/4	4 7/8	.....	.....	.....
	Brass No. 21 B. & S. Gage—Diameter of Blank 9 Inches								
Diameter...	4 3/16	3 3/8	3 1/8	2 13/16	2 7/16	2 5/16	2 1/8	.....	.....
Height.....	3 3/8	5 3/8	6	7	8 5/8	10 7/8	13 1/2	.....	.....
Gage*......	21	21	21	22	23	24	25	.....	.....
	Brass No. 20 B. & S. Gage—Diameter of Blank 10 1/2 Inches								
Diameter...	6 1/4	5	4 3/8	4	3 3/4	.....	.....	.....	.....
Height.....	3 1/8	4 3/8	7 1/8	10	11 1/4	.....	.....	.....	.....
Gage*......	20	22	24	25	26	.....	.....	.....	.....
	Brass No. 19 B. & S. Gage—Diameter of Blank 5 7/8 Inches								
Diameter...	2 13/16	2 1/16	1 23/32	1 1/2	1 11/32	1 3/16	.....	.....	.....
Height.....	2 9/16	3 5/8	5 3/8	6 19/32	9 3/8	12 1/8	.....	.....	.....
Gage*......	19	19	21	23	23	26	.....	.....	.....
	Brass No. 19 B. & S. Gage—Diameter of Blank 1 5/32 Inches								
Diameter...	1 41/64	7/16	3/8	11/32	19/64	17/64	1/4	.....	.....
Height.....	11/32	5/8	1 1/16	1 11/16	2 13/32	4 1/32	5 9/16	.....	.....
Gage*......	19	20	22	23	26	28	30	.....	.....
	Copper No. 20 B. & S. Gage—Diameter of Blank 9 Inches								
Diameter...	4 3/4	4 3/8	4	3 5/8	3 1/4	2 7/8	2 1/2	2 1/4	2
Height.....	2 1/2	3 1/2	5	6 1/2	8 1/2	10 1/2	12	13 1/2	15
	Copper No. 14 B. & S. Gage—Diameter of Blank 3 1/2 Inches								
Diameter...	2 5/32	1 13/16	1 1/2	1 1/4	1 1/32	0.939	.....	.....	.....
Height.....	1 15/32	1 3/4	2 7/32	2 21/32	3 1/4	3 13/16	.....	.....	.....
	Aluminum No. 27 B. & S. Gage—Diameter of Blank 5 11/16 Inches								
Diameter...	3 1/4	2 3/4	2 1/2	2 3/16	1 7/8	1 5/8	.....	.....	.....
Height.....	1 5/8	2 1/8	2 1/2	3	3 3/8	3 1/2	.....	.....	.....
	Aluminum No. 24 B. & S. Gage—Diameter of Blank 5 5/8 Inches								
Diameter...	2 1/16	1 7/16	1	3/4	.....	.....	.....	.....	.....
Height.....	1 1/2	2 1/4	3 1/4	5	.....	.....	.....	.....	.....

*Thickness of shell after each drawing operation—B. & S. Gage.

Protective Coating for Paper

A unique method of making paper well nigh indestructible is said to have been developed in Switzerland. The sheets of paper are given a protective coating of tin, copper, or aluminum by means of metal spraying. The product is said to be very flexible and to be well adapted for paper money. It will last practically indefinitely.

The Metal Trades Association Meets

Unemployment Insurance, the Training of Apprentices, and Preparation for Foremanship were Subjects Discussed at the Cincinnati Meeting

THE thirty-third annual convention of the National Metal Trades Association held in Cincinnati, April 15 and 16, was one of the outstanding meetings of the Association. The attendance was unusually large, and the subjects discussed covered a broad range of the present-day problems of the industry. Among these topics, unemployment insurance, apprenticeship, and the training of foremen occupied a prominent place. Other subjects dealt with were accident prevention in the industries and the present railroad transportation situation.

On the subject of industrial education and trade training, the president of the Association, J. G. Benedict of the Landis Machine Co., Waynesboro, Pa., made some very definite statements in his opening address. "The conditions that have prevailed during the past year," said Mr. Benedict, "have made it possible to ascertain that the value of employe training is now held in higher regard by our members than at any previous time. There was a time when apprentices were added to the payroll promiscuously during times of prosperity, and at the first signs of business curtailment they were laid off indefinitely or discharged.

J. G. Benedict, General Manager, Landis Machine Co., Re-elected President of the National Metal Trades Association

"Fortunately this condition has not been prevalent during the past year, and I believe that the persistent efforts of our Educational Department have done much to discourage this unsound practice. True, the total number of apprentices employed in member plants today is smaller than a year ago, but the decrease is largely due to graduations and voluntary resignations. Replacement has been limited somewhat, but only a few of the losses in number of apprentices employed are due to discharges or indefinite layoffs because of slack business. The progressive employer realizes that in order to obtain the greatest return from rational management, he must continue to develop and train apprentices. On January 1, 1931, there were 394 member plants that regularly trained apprentices, with a total of 3857 apprentices under training."

In his report as chairman of the Educational Committee of the Association, Harold S. Falk of the Falk Corporation, Milwaukee, Wis., laid further stress on the importance of apprentice training to the individual manufacturer, to the industry, and to the community as a whole. C. W. Pendock of the LeRoi Co., Milwaukee, Wis., outlined actual accomplishments of foremanship training.

The discussion of stabilization of employment and unemployment insurance took a great deal of the time at the convention. After more than sixteen months of intense research effort, the Association has published a report entitled "Stabilizing Employment in the Metal Trades." This report offers many suggestions on matters within the control of industry that affect employment fluctuations.

Several of the addresses made before the meeting dealt with different phases of employment and its stabilization, unemployment insurance, and means for overcoming the evil of seasonal variations in production. Glenn A. Bowers spoke on the subject of "Europe and Unemployment Insurance," summarizing the experience of European nations and especially emphasizing that, if the industries in the United States want to prevent unemployment insurance from becoming a political football, they must step in and take an active leadership in the formulating of such policies as will alleviate the hardships of recurring unemployment. They must devise ways and means whereby industry may set up a system for coping with the difficulties of unemployment that will be free from some of the defects of the European methods.

"The Rochester Unemployment Benefit Fund" was the subject of a paper by M. B. Folsom of the Eastman Kodak Co., Rochester, N. Y. The general principles of this plan were described in April MACHINERY, page 622. Mr. Folsom stated that, based on the records of unemployment in a number of Rochester plants for several years, from 1 to 2 per cent of the annual payroll, regularly set aside, will build up a fund that will take care of the unemployment situation in times of depression in

most plants that do not have excessive fluctuations in employment. He also emphasized that the benefits derived from such a fund are greater than the cost.

James D. Craig of the Metropolitan Life Insurance Co., spoke on the possibilities of private unemployment insurance, advocating this means to avoid the pitfalls of unemployment insurance into which the governments of England and Germany have fallen. Dr. Otto P. Geier of the Cincinnati Milling Machine Co., reporting for the Industrial Relations Committee of the Association, laid stress on the point that the time has come in our industrial progress when it would be proper for chief executives to take their minds partly off the mere mechanical problems and give more attention to the human and social questions that have arisen through the rapid development of industry.

Great interest centered on the paper "The Machine Age and its Consequences," read by Franklyn Hobbs of the Central Trust Co., Chicago, Ill. Mr. Hobbs pointed out that improved machinery has not reduced employment in industry, but, if anything, has increased it; and that it has greatly increased wages and shortened working hours during the past thirty years. The essence of Mr. Hobbs' paper was the same as that of his address delivered some months ago in Chicago, which was published in February MACHINERY, page 462.

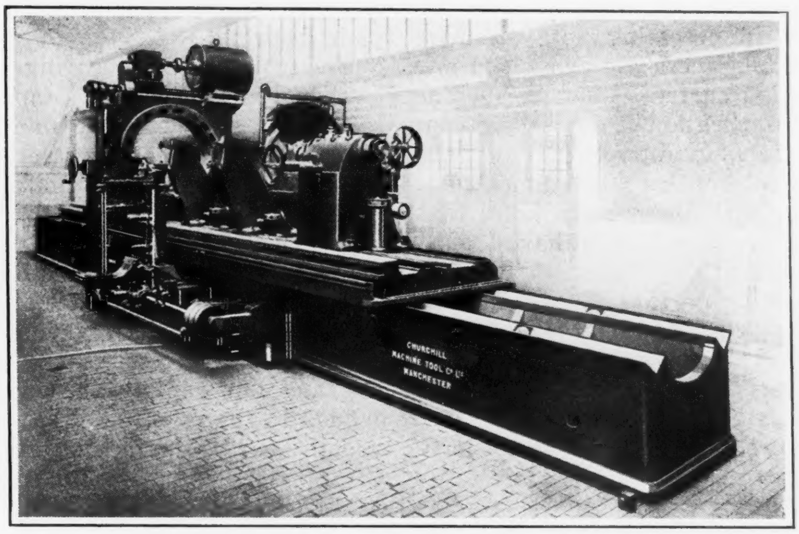
In an informative and forceful address by Samuel O. Dunn, editor of the *Railway Age*, entitled "Our Transportation Problems to Date," the importance of fair and impartial treatment of our railroads in national and state legislation was emphasized. No matter what supplementary means of transportation are developed, our railroads still constitute our primary and most essential form of transportation; and as such they must be given sufficient freedom of management to be able to do business on a reasonable business basis.

The following officers were elected: J. G. Benedict, Landis Machine Co., Waynesboro, Pa., president; Jacob D. Cox, Cleveland Twist Drill Co., Cleveland, Ohio, first vice-president; Alexander Sellers, William Sellers & Co., Philadelphia, Pa., second vice-president; and J. W. O'Leary of the Arthur J. O'Leary & Son Co., Chicago, Ill., treasurer.

Large English Grinding Machines

Commenting upon some of the large machines that have been shown from time to time in MACHINERY, the Churchill Machine Tool Co., Ltd., of Manchester, England, calls our attention to some large grinding machines that have been built by this company in the plain grinding machine class. The accompanying illustration shows such a machine designed for grinding the journals and pins of marine engine crankshafts. This machine will swing work 72 inches in diameter. Because of this large capacity, a central work drive is used instead of the conventional work-head drive.

For grinding the line bearings of crankshafts, a plain grinding machine, 50 by 300 inches, was built several years ago; another heavy plain grinding machine built for grinding rolling mill rolls has a capacity of 48 by 288 inches; and a machine built for grinding paper mill rolls has a capacity of 36 by 350 inches. Traveling wheel-head type roll grinding machines of still larger capacity have also been built by the same company.



A Plain Grinding Machine which will Swing Work Six Feet in Diameter, Designed for Grinding Marine Engine Crankshafts

Economic Engineering Conference

An economic conference for engineers will be held August 30 to September 7 at the Engineering Camp of Stevens Institute of Technology near Johnsonburg, Warren County, N. J. The conference will be held under the joint auspices of the engineering alumni of Columbia University and of Stevens Institute, and will be open to graduates of other colleges and junior members of the national engineering societies.

Each day's program will have two main elements: In the morning there will be lectures and discussions relating to "The Dollar Factor in Engineering," and in the evening open forum and round-table discussions will be held to consider the elements in depression and seasonal and cyclical fluctuations. The lectures and conferences will be under the direction of William Duane Ennis, head of the Stevens Department of Economics of Engineering, who will be assisted by members of the Stevens and Columbia faculties. The camp has exceptionally good facilities for recreation.

Fig. 1. Photomicrograph of a Typical Reamed Surface

"Bearing-izing" Reamed Holes

New Compression Method of Producing Highly Finished Bearing Surfaces in Holes

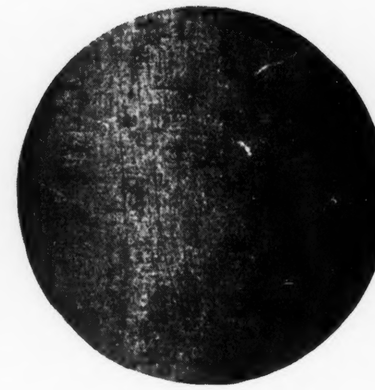


Fig. 2. Photomicrograph of a "Bearing-ized" Surface

INDUSTRY'S requirements for accurate, straight, friction-free holes are becoming more and more exacting. Closer tolerances are demanded and the condition of bearing surfaces must be such as to insure satisfactory operation under severe conditions of service. It is comparatively easy to make reaming or boring tools of specified dimensions. However, to produce, with these tools, holes that are accurate in diameter, straight, and have a good bearing surface is not a simple matter. With both rotating and reciprocating parts the best condition has been obtained by "running in" the bearings. However, that process is slow, and there is always danger of the bearings being seriously damaged before the machine has been broken in.

A rapid method of producing accurate holes having a bearing surface comparable to that obtained by "running in" has been developed by the Cogsdill Mfg. Co., Detroit, Mich. This process, which is known as "bearing-izing," is capable of holding the diameter of the hole within close limits. The method can be employed for holes of various sizes in both ferrous and non-ferrous metals.

Holes to be "bearing-ized" are reamed slightly under size, after which the "bearing-izing" operation peens or swages the surface metal, bringing the hole accurately to size, eliminating all small serrations or tool marks, and compressing the metal so that a smooth bearing surface is produced which is said to be as nearly friction-free as it is possible to obtain in a plain bearing.

The tool used for "bearing-izing" is constructed, as shown in Fig. 4, with a taper shank that fits the socket in a spindle of the machine designed for the operation. This tool has a series of hardened peening shafts, the number and size of which depend upon the nature of the work. The peening shafts are carried by a retainer and run over a cam having the same number of lobes as there are shafts in the retainer. As the tool rotates at high speed, the cam-operated peening shafts deliver blows on the work in very rapid succession. By this method, the excess metal is rapidly peened and the hole is expanded to the required size, with the result that a smooth bearing surface is produced.

Fig. 3. Single-spindle Machine Designed for the "Bearing-izing" of Small- and Medium-sized Parts

Special machines have been built by the Cogsdill Mfg. Co. for performing this operation. The machine shown in Fig. 3 is of single-purpose design. Usually, the machine can be provided with one slow-running spindle for reaming and a fast-running spindle for "bearing-izing" the hole after the reaming operation has been completed. The spindle of the machine illustrated is belt-driven by an electric motor housed in the base. The reciprocating table carries a quick-acting floating fixture by which the work is fed on the "bearing-izing" tool and withdrawn. This table is actuated by a hand-lever through a rack-and-pinion feed.

During an experimental period of two years, parts have been "bearing-ized" for a number of automobile manufacturers, including such parts as valve-stem guides and other small- and medium-sized bearings. As there is practically no wear on the "bearing-izing" tool, it is estimated that a single tool can be used for thousands of pieces.

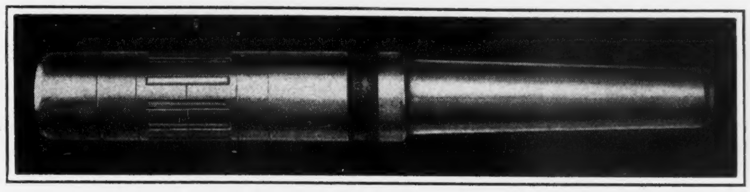


Fig. 4. "Bearing-izer" which Produces Highly Finished Bearing Surfaces in Holes through the Peening Action of a Series of Shafts

* * *

Census of Small Metal-working Tools and Accessories

The production of tools, dies, and fixtures in 1929, as published by the Bureau of Census, Washington, D. C., was briefly referred to on page 509 of March MACHINERY. More complete data on the production of small metal-cutting tools and machine tool accessories are now available, and are given in the accompanying table.

In 1929, there were 591 shops engaged in the making of jigs, tools, dies, and fixtures. The average number of wage earners was 15,935, and the total value of the product was $86,859,175.

The number of plants engaged in the manufacture of small metal-cutting tools was 131, with an average number of wage earners of 10,731. The total value of the product in this branch of the industry was $57,551,715.

Reducing the Number of Trade Names

The Allegheny Steel Co., Brackenbridge, Pa., has taken a step in the direction of ending the confusion in the alloy steel field due to the large number of trade names used. The company proposes to use the trade name Allegheny in connection with all of its products. The whole group of chromium and chromium-nickel steels made by the company will be known as Allegheny Alloys. The name Allegheny Metal will remain unchanged, but the alloys hitherto bearing the name of Ascoloy will be known as Allegheny, with a numeral following to indicate the type of the alloy. The action of the company follows a survey that developed the fact that there are now 104 different trade names in the alloy steel field in this country. This action is intended to aid engineers and buyers in identifying readily the different alloy steels available.

Production of Machine Tool Accessories and Small Metal-cutting Tools in 1929
(Data Compiled by the Bureau of Census)

Class of Tools and Accessories	1929
Machine tool accessories and small metal-cutting tools made in all industries, aggregate value	*$167,230,319*
Machine tool accessories and small metal-cutting tools made in the tool industry	134,565,862
Made as secondary products in the "Machine Tool" and "Stamped Ware, Enameled Ware, and Metal Stamping, Enameling, Japanning, and Lacquering" industries*	32,664,457
Attachments and fixtures, total value	*94,027,541*
General equipment:	
Chucks (lathe)	2,725,483
Chucks (drill)	1,309,913
Chucks (magnetic)	326,254
Jaws (faceplate)	88,512
Die-heads (threading)	718,600
Dividing heads	20,265
Vises (machine)	182,232
All other accessories	46,259
Special equipment:	
Jigs and fixtures	19,762,019
Sub-presses, punches, dies, etc.	45,584,660
Die-casting and drop-forging dies	1,232,754
Tools for screw and automatic machines: Box-tools, hollow mills, work- and tool-holders, etc.	4,046,307
Specially designed tools	5,652,279
Special machinery	5,066,984
Special order work not reported by kind	1,780,973
All other attachments and fixtures	5,484,047

Class of Tools and Accessories	1929
Small tools, total value	*$73,202,778*
Arbors and collars	278,167
Collets	343,342
Counterbores	1,116,719
Countersinks	65,222
Drills (carbon)	4,096,029
Drills (high-speed)	9,911,434
Hobbing cutters (high-speed)	2,078,916
Lathe tools (carbon)	457,177
Lathe tools (high-speed)	683,466
Milling cutters (carbon)	558,463
Milling cutters (high-speed)	10,146,063
Reamers (carbon)	3,114,356
Reamers (high-speed)	5,042,556
Saw blades	292,615
Threading tools:	
Taps and dies (not pipe threading):	
Taps (carbon)	3,526,272
Taps (high-speed)	3,069,694
Dies (carbon)	1,337,119
Dies (high-speed)	1,362,676
Chasers	3,251,469
Pipe threading tools:	
Taps	300,435
Dies	1,346,867
Pipe stocks complete with dies	2,338,528
All other small tools	11,595,495
Precision measuring tools and gages	5,870,807
Other measuring tools	1,018,891

*Machine tool accessories and small metal-working tools are made to some extent as secondary products in still other industries, but this production is unimportant.

A New Method of Selling Machine Tools

A Leading Machine Tool Builder and Distributor Pioneers a Sales Plan that Combines the Advantages of Both the Direct and the Dealer Method of Selling

By A. G. BRYANT, General Manager Machinery Division, Joseph T. Ryerson & Son, Inc., Secretary and Treasurer, Associated Machine Tool Dealers

THE fluctuation in the demand for machine tools is well known to all who have followed what has been published in the technical press on the conditions under which the machine tool industry functions. It may not be generally appreciated, however, that the orders booked by this industry in November, 1930, were only 20 per cent of what they were in October, 1929—thirteen months earlier. Even this violent fluctuation does not equal the decline in 1920 and 1921, when orders dropped to less than 8 per cent of the previous peak. In a period when the total industrial production in the United States declined less than 30 per cent—from the middle of 1929 to the middle of 1930—the demand for machine tools declined almost 70 per cent.

It will be obvious to any business executive that great difficulties are involved in conducting a business where such fluctuations occur. Not only is the machine tool industry called upon to solve engineering problems of the highest order, but its sales and distribution problems evidently become extremely difficult because of these fluctuations. Furthermore the stabilizing of the "demand curve" of machine tools is dependent to a large extent upon the effectiveness of the industry's facilities for the merchandising of its products.

A. G. Bryant Describes a New Plan for Coordinating the Sales Forces of Manufacturers and Dealers

Methods of Selling Machine Tools

Probably about three-quarters of the machine tools sold in the United States are handled through local dealers who have exclusive representation in their territories for individual machine tool builders. The remainder are sold directly by the manufacturers through their own sales departments. The company with which the writer is connected is both a builder of machinery, engaged in the manufacture and sale of its products through its own organization and through local machine tool dealers, and a distributor or dealer selling machine tools built by other manufacturers. This company, therefore, is experienced in the problems of both the manufacturer and the dealer, and its methods of distribution are based on the best practices of each branch of the industry.

Advantages of Prevailing Selling Methods

Unbiased opinion points to the fact that there are many advantages to machine tool buyers, as well as to the machine tool industry, in the distribution of machine tools through local dealers. At the same time, there are doubtless machine tools that may be better represented to the trade directly by the manufacturing organization. Very few manufacturers distribute their entire output directly, as practically all have local dealers in some geographical sections, who supplement their own factory sales office. On the other hand, there are many machine tool manufacturers who distribute primarily through dealers, and who find it expedient to solicit a comparatively small part of their business directly.

From the buyer's standpoint, the principal advantages of the two methods are obvious. The direct-selling manufacturer usually has a sales force consisting of specialists who are better experienced on the one type of equipment being built than a local sales organization could be. This is not universally the case, but as a rule, it is an accurate appraisal of the conditions.

On the other hand, the local dealer's salesmen are usually men well versed in the application of all types of machine tools. To the buyer this is very important, as he frequently needs unbiased advice in the selection of equipment. A dealer's representative is in a better position to give such assistance. The dealer's organization is also in more intimate and regular contact with the machine tool user, and this, of course, reacts to the benefit of both the builder and the user.

A New Plan for Distributing Machine Tools

Facing within its own organization the problems of the direct-selling manufacturer, as well as those of the local dealer, the company with which the writer is connected undertook the development of a new plan for the coordination of the sales forces of both the manufacturer and dealer in such a way as to provide for more efficient sales effort and greater service to the trade. Utilizing the existing national organization, including nearly a score of

offices, and combining with this a local dealer distribution, the company inaugurated a plan known as the "general distributor" plan.

Briefly speaking, this plan enables the company not only to sell its own products effectively, but also to act as the sales department for other manufacturers. The general plan is as follows:

1. The general distributor acts for a manufacturer throughout the entire country as his sales department, and is responsible for sales policies, sales engineering, advertising, and other sales promotion.

2. The manufacturer confines himself to production, engineering, and service, thus enabling him to give his entire attention to developing and producing equipment according to his best standards.

3. The general distributor, having a national organization, is able better to direct sales policies, make sales contacts, and prepare catalogue material, and advertising copy. As he can have a central sales engineering staff, he is able to provide for the trade the specialized technical assistance now so generally required in the sales and service of many lines of machine tools. Through this engineering staff, he can intelligently represent the manufacturer and greatly supplement the local dealer's salesman in his efforts. In this way the machine tool user has the benefit both of constant local contact with the machine tool dealer's salesman and the benefit of technical assistance when required.

4. In some sections the general distributor utilizes his own machine tool sales organization—direct-selling. In other districts, independent local dealers operate on an exclusive basis, the same as in the past. When it appears to be an advantage, local machine tool dealers are given representation even when the general distributor maintains an office and a direct-selling organization in the same territory. The general distributor, recognizing the efficiency of local dealers, maintains exclusive dealer arrangements in practically all sections of the country. The distributor's own sales force maintains the same relationship with these dealers as companies selling to dealers and having their own sales forces have maintained under past methods.

This plan is probably unique in the selling of metal-working machinery. It has one outstanding advantage seldom found in a new plan—namely, that nothing of any value in connection with either of the former plans of distribution has been discarded. The manufacturer still has his full responsibility for the manufacture of his product—the local dealer still retains his full rights and responsibility as the sales representative. The general distributor functions as the sales department for his own products, as well as for those of the manufacturers who sell through him. It is obvious that he is able to coordinate the sales functions in a manner that is of advantage to manufacturers, dealers, and buyers of machine tools.

Any sales plan, regardless of its efficiency or economy, must be valuable and satisfactory to the buying trade that it serves. The general distributor plan for handling machine tools has been conceived primarily with the idea of furnishing to the machine tool buyer better advice and assistance in selecting machine tool equipment than would otherwise be possible.

Centrifugal Method of Making Cast-iron Pipe

In a paper on the production of cast-iron pipe by the centrifugal method, read before the Birmingham meeting of the American Society of Mechanical Engineers, S. B. Clark, research engineer of the U. S. Pipe & Foundry Co., referred to the early history of this method. It is of interest to note that the efforts to produce pipe by making use of centrifugal force date back at least to 1850. In the early attempts, sand-lined molds were used, although there are instances on record of trials with steel and cast-iron molds. However, none of these early experiments proved commercially successful.

In 1914, deLavaud, a Brazilian engineer, started experiments in Santos, Brazil, for casting pipe by the centrifugal method in permanent cast-iron molds. From this beginning the process known by his name has been developed. Until the latter part of 1922, pipe made by this process was produced on a relatively small scale. In 1922, however, a machine casting from ten to fifteen 6-inch pipes, 12 feet long, per hour, was operating satisfactorily, and in 1926, four hundred 6-inch pipes were produced in a ten-hour day. At the present time, machines producing pipes up to 24 inches in diameter and 18 feet in length are in successful operation.

Mr. Clark concluded his paper as follows: "The older methods of producing cast-iron pipe, which, in principle, have remained unchanged for centuries, are gradually giving way, as regards the smaller sizes at least, to the more modern and scientific methods employed in the manufacture of centrifugal pipe."

In the Mono-cast centrifugal process of producing cast-iron pipe, a sand-lined mold is used. The molten metal is "spun" into this sand-lined mold, covering the walls while under considerable pressure due to the rotation. Pipes made by this process are now being manufactured in sizes up to 24 inches in diameter and 16 feet long. S. D. Moxley, chief engineer of the American Cast Iron Pipe Co., described this process in a paper also presented before the Birmingham meeting.

Westinghouse Salute to Machinery Industry

In the series of broadcasts over the National Broadcasting Co.'s stations known as the Westinghouse Salutes to Industry, the one emphasizing the value and importance of the machinery industry went "on the air" Sunday evening, April 26. In response to the salute, Carl A. Johnson, president of the National Machine Tool Builders' Association and president of the Gisholt Machine Co., made the following remarks over the radio:

"I am glad that this Westinghouse Salute to the Machinery Industry permits me to discuss a subject that affects American progress. If the manufacturers of America could honestly say today, 'We are buying now,' they would not need to say to their consumers, 'Buy now,' and the clouds of depression would soon pass away.

"There is a way in which American industry could start a series of buying movements with profit to itself, thereby giving employment to hundreds of thousands of men now out of work, and breaking the 'vicious circle' of delayed purchases.

"Replace with modern, improved machinery the obsolete, out-of-date machinery now being used for production. The need for such replacement is shown by the proved fact that 48 per cent of all metal-working machinery in this country is over ten years old, and, generally speaking, machinery ten years old is out of date. A machine becomes out of date just as soon as another machine is developed that will do more or better work.

"You would not buy for your own use a radio, automobile, or tire made ten, or even five, years ago, at the original price, even it it were perfectly new, because you know you can get very much better service from up-to-date models. How much more important it is for you as an employe, a stockholder, an officer, or a creditor of a company using machinery to know that your company's plant equipment is of the most modern character.

"It costs more to use an obsolete machine than it costs to buy a new one. Hence the user of obsolete machinery pays for the new machine in waste, but neither he, nor his workers, nor his stockholders get the benefit. It has been conclusively shown, many times over, that time-saving machinery raises wages, creates more jobs, and makes available a greater choice of jobs for this and for each succeeding generation of workers. We have, in fact, attained our present standards of living only by the thoroughly American process of constantly improving our machinery, and we can maintain and improve these standards only by rigidly adhering to this policy.

"It has been the practice in most industries for the works manager to ask the management for new machines and be compelled to argue for them. The roles should be reversed. Pressure for the replacement of out-of-date machinery should come *from the management down and not from the works up.*

"At least once a year, management should procure a list of machines in use, classified by age. Then the works manager should be compelled to prove that any machine over ten years old can still be profitably used. This simple procedure would disclose some startling leakages of money in almost every plant.

"Since a plant equipped with modern machinery is better security for loans than an obsolete plant, bankers have begun to inquire into the condition of a plant's equipment with the same care they now give to its financial statement. A management keeping obsolete machinery too long in service will in time find itself at the mercy of an up-to-date competitor. Hence, stockholders are also deeply interested in the same subject.

"This little jingle that I heard recently, is a good slogan for all American industry: 'Old machinery in the shop shows obsolescence at the top.'"

Steel Founders' Society Organizes Consulting Service

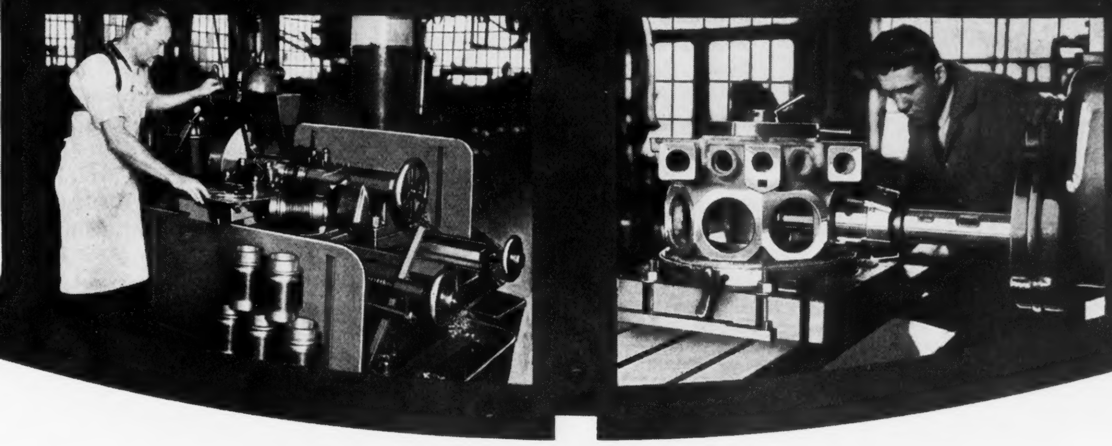
The Steel Founders' Society of America has established an engineering department with the purpose of offering consulting service to mechanical engineers and designers engaged in the selection and application of castings. This department is prepared to furnish assistance in solving the following problems:

1. Proper apportioning of metal sections for best casting results.
2. Types of cast steels that are available to satisfy desired physical specifications.
3. Redesign of products previously constructed in metals other than cast steel.
4. Redesign of cast-steel members with which trouble has been experienced.
5. Locating of foundries capable of handling individual requirements.
6. Relative merits of cast steel, as compared with other materials, for specific kinds of service.
7. Engineering problems involved in the construction of machinery and equipment of all kinds where cast steel is being considered.

In addition to the foregoing, informal discussions will be held with small groups of designers and others interested to promote a better working knowledge of the products of the steel foundry.

Requests for advice may be addressed to Development Engineering Department, Steel Founders' Society of America, Inc., 420 Lexington Ave., New York City.

New Shop Equipment



A Monthly Record of the Latest Developments in Metal-working Machinery, Small Tools, and Work-handling Appliances

"Bore-Matic" Precision Hole Finishing Machine

A machine known as the "Bore-Matic" has been developed by the Heald Machine Co., Worcester, Mass., for the precision-boring of holes by the use of diamonds or tungsten-carbide tools. It may also be employed for rough-boring and for turning, if necessary, and has the flexibility essential for handling a large variety of work. Straight, tapered, blind, and interrupted holes can be rough- and finish-bored in any free cutting material such as bronze, aluminum, fiber, Bakelite, etc., as well as in high quality soft cast iron.

The machine has been ruggedly proportioned with the view of providing the rigidity necessary for the types of tools employed. It weighs approximately 7000 pounds, the over-all dimensions of the base being 67 1/2 by 33 1/2 inches. Hydraulic equipment similar to that used on Heald internal grinding machines provides smooth operation of the table at feeds ranging from 1/2 to 15 inches per minute, as well as at the maximum rapid traverse of 15 feet per minute. Holes from 5/16 to 5 inches in diameter and up to 7 inches in length can be bored.

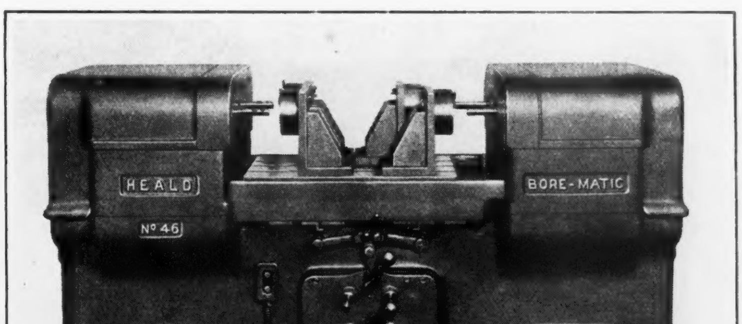


Fig. 1. Heald "Bore-Matic" Designed for Finishing Holes with Diamond or Tungsten-carbide Tools

The table travels on flat and V ways of the base casting. A continuous flow of oil is delivered to the ways by the hydraulic system. There is a finished pad in the center of the table which provides for mounting work fixtures. A spout at the rear carries away coolant and chips.

The boring-head bridges are one-piece castings bolted to the base. Accurately positioned buttons on each bridge surface serve as locating points for lining up the boring heads, while three transverse T-slots provide for clamping the heads in position.

All the controls are concentrated in a box which has an exterior panel on the front of the machine. Valves inside this box govern every function of the machine except

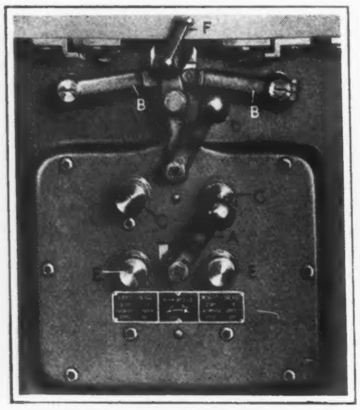


Fig. 2. Close-up View of the Control-box Panel

that of starting and stopping the driving motor and loading and unloading the fixtures. Starting and stopping of the table are controlled by a centrally located throttle lever *A*, Fig. 2. Boring feeds are controlled by two valves operated through levers *B* which are actuated by table cams. These cams can be made to give a constant feed for finishing a continuous bore or to give an intermittent feed with an intermediate period of fast travel for finishing interrupted bores. Hand-knobs *C*, which can be adjusted to give a different rate of table feed in each boring position, are used to set the valves.

Lever *D* provides for both automatic and hand reversal of the table, the table moving in the direction in which the lever is moved. Starting, stopping, and automatic operation of the boring heads are controlled by two push-pull knobs *E*.

Cams on the table are also used in connection with reverse dogs to obtain a safety reversing control. When both ends of the machine are being used for boring, the table moves rapidly from one end to the other. In order to prevent this movement before the operator has finished loading a fixture, there is a safety reversing lever *F* which the operator normally moves each time that he finishes loading one end of the machine. The machine then repeats its cycle without interruption. However, should the operator be delayed in loading one end, the table will stop at the other end as soon as the boring operation is completed and remain stationary until the operator moves the safety lever in the direction in which the table is to move next.

Simple hand-operated fixtures can be used for plain bushings, sleeves, guides, bearings, etc., while for parts that are more complicated, automatic fixtures, operated either mechanically or hydraulically, can be furnished.

The drive for the entire machine is obtained from a 7 1/2-horsepower motor which is connected through a flexible coupling direct to a jack-shaft at the rear of the base casting. Power is transmitted from this shaft for driving the clutch-brake units that drive the boring heads, the oil-pump of the hydraulic system, and the coolant pump. Boring tools made with diamonds or tungsten-carbide bits are obtainable from the Heald Machine Co. for use with this equipment.

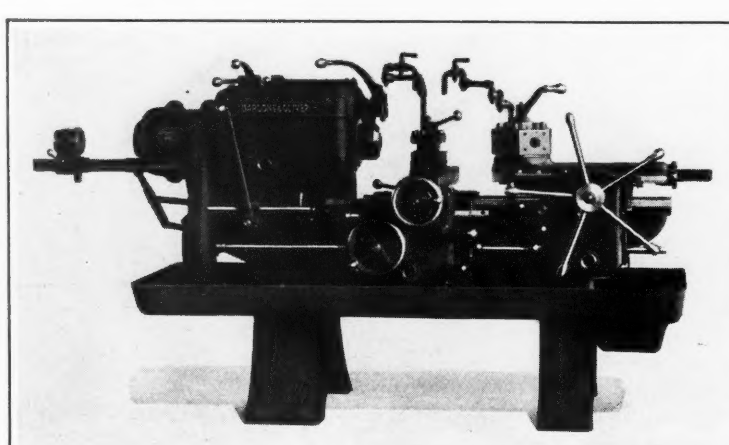
Bardons & Oliver Universal Turret Lathe

The fortieth anniversary of Bardons & Oliver, Cleveland, Ohio, as builders of turret lathes, is being celebrated by the introduction on the market of the new No. 4 universal machine here illustrated. This machine has been designed to suit the use of tungsten-carbide tools through the provision of higher spindle speeds, greater power, increased rigidity, and a wider feed range.

Twelve spindle speeds ranging from 38 to 1025 revolutions per minute are obtainable through the all-geared head. The automatic chuck has capacity for 1 13/16-inch round stock. The 7 1/2-horsepower motor used for driving the machine permits multiple cuts to be taken simultaneously by tools in both the turret and carriage. The swing over the bed is 18 inches.

In addition to the two multiple-disk clutches ordinarily used for starting, stopping, and reversing, there are two other clutches through which an instantaneous speed reduction of about 3 1/2 to 1 may be obtained. This is particularly advantageous when it is necessary to change from turning, drilling, or forming speeds to threading, tapping, or reaming speeds on each individual piece produced. Sliding gears furnish all other speed changes. The disk-clutch and sliding-gear levers are located on top of the head. All shafts and gears are made of heat-treated alloy steel. There are no revolving gears on the spindle.

The spindle is made with a flanged end which insures a rigid mounting for chucks or fixtures and reduces to a minimum the overhang from the front spindle bearing. Threaded-type spindle ends can also be furnished.



Bardons & Oliver Turret Lathe Designed to Use Tungsten-carbide Tools

The motor is of the standard flanged type and is bolted direct to the left end of the head. The rotor is pressed on the first drive shaft and, thus, the motor becomes an integral part of the machine, with all belts, pulleys, chains, or sprockets eliminated.

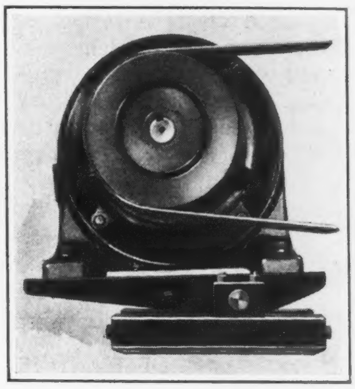
Power feed units are provided for the turret, carriage, and cross-slide. Nine feed changes in geometric progression are obtainable independently in each apron unit through levers, conveniently located. The high-speed feed-shafts are mounted in anti-friction bearings. Feeds are engaged and disengaged by means of lever- and cam-operated cone friction clutches. Disengagement may be accomplished either automatically by means of stop-screws or by hand. The aprons are of the fully enclosed box type with their gears running in baths of oil for which visible oil gages are supplied.

Automatic indexing of both square and hexagonal turrets is provided for. Turret faces of standard dimensions permit the use of other makes of tools. The weight of this turret lathe, equipped with an automatic chuck, bar feed, and motor, is approximately 3200 pounds.

Kritzer Floating Motor Drive

A floating motor drive recently placed on the market by the Kritzer Co., 515 W. 35th St., Chicago, Ill., uses the motor torque to automatically regulate the belt tension. The electrical reaction between the rotor and the frame tends to revolve the frame in the opposite direction to the rotor. Thus, by pivoting the frame at the proper point, this action is employed to increase the distance between the belt pulley centers and thereby keep the belt tension proportional to the load. The position of the motor when not in operation is such that there is practically no pressure on the belt.

When power is first applied, the inertia of the driven unit "locks" the rotor, putting extra tension on the belt during the starting period. The running position of the motor after the load is up to speed serves to maintain just enough pressure on the belt to prevent slippage.

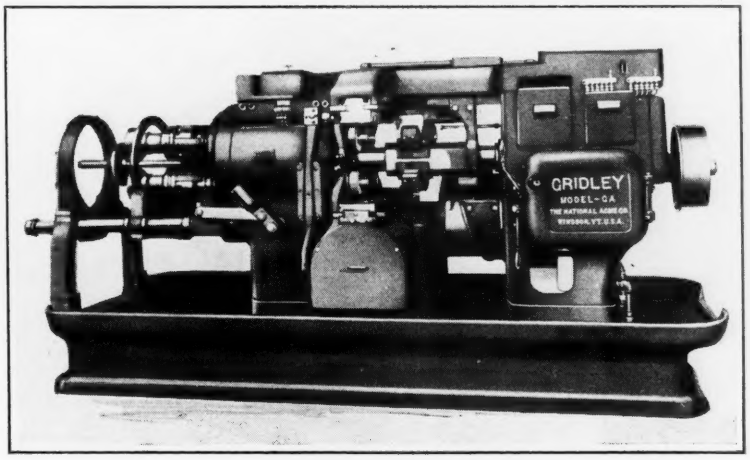


Kritzer Motor Drive Designed to Keep Belt Tension Proportional to Load

This drive is regularly made in sizes suitable for motors ranging from 1/2 to 3 horsepower. It can also be made for application to larger motors.

Gridley Improved Automatic Screw Machine

The National Acme Co., Cleveland, Ohio, has recently made a number of important improvements in the Model G-A Gridley automatic screw machine which was introduced to our readers in June, 1930, MACHINERY, page 819. From the accompanying illustration, it will be seen that the frame of the new machine is so designed that chips from the cutting tools can flow from the center of the frame into the pan. The straight-line pan construction permits the chip guards to be mounted on rollers, so that they can be moved sidewise with little effort. This feature is convenient in making tool adjustments.



Gridley Automatic Screw Machine of Improved Design

Oil is separated from the chips by means of a perforated plate in the pan. The chips can be removed readily from both ends of the pan without stopping the machine. An exceptional amount of clearance exists between the frame and the pan at the center of the machine, so that the chip room available is approximately four times that provided in previous models. A conveyor or other device can be easily installed for removing the chips.

The spindle carrier is supported on three bearings, and is approximately 5 inches longer than on previous Gridley automatics. The collet tubes and feed tubes are proportionately longer. Both the spools and finger-holders are of heavy design to provide a large bearing surface for the chucking shoe. Springs on the holders prevent the fingers from flying out or loosening under the centrifugal force produced by a high spindle speed. The indexing mechanism is furnished with wide and heavy blocks to insure smooth indexing and locking.

The main tool-slide has been

lengthened about 5 inches, and operates on a hardened and ground extension of the spindle carrier. The tool-slide is bronze-bushed at each end, and is provided with a wiper in front which prevents grit or chips from entering between the bushing and the carrier extension. The space between the spindles and the gear-box section has been lengthened approximately 5 inches to make the main tool-slide stronger and to provide additional surface for mounting combination tools.

The forming and cut-off slides, that is, the two bottom cross-slides, are mounted on supports cast integral with the bed. Hardened and ground steel guides on these supports eliminate wear of the bed casting. The two upper cross-slides are of the same design as the bottom cross-slides, except that they are placed in a reverse position. Each slide is operated independently by cams on drums. These drums are completely covered in order to prevent chips from reaching the cams.

The main camshaft is controlled by worm-gearing, which also controls the indexing mechanism, cross-slides, tool-slide, and the feeding and chucking mechanism. The worm-gear is equipped with a safety disk, which permits its rim to rotate and the camshaft to stop in case of dull tools or in the event of interference with any part of the machine which might cause an accident or breakage.

Threads can be cut in either the third or the fourth positions of this machine or in both. The threading attachments can also be used for accelerated reaming or turning operations. High-speed drilling attachments can be used in all four positions.

Henry & Wright All-Steel Presses

A series of all-steel straight-sided and inclinable presses has been brought out to complement the line of dieing machines made by the Henry & Wright Mfg. Co., Hartford, Conn. The straight-sided presses are furnished in either flywheel, single-geared, double-geared, or triple-geared types with crankshafts up to 12 inches in diameter. The larger presses are equipped with a single or twin gear drive, as preferred.

Fig. 1 shows the shrunk-in tie-rod construction employed on a single-crank, straight-sided press of the flywheel type. The base, uprights, crown, and slide are made from steel plates, cut and formed to the desired shapes and arc-welded together. The fabricated steel units are annealed before machining so as to eliminate any strains which might have been set up in the rolling or welding processes. This prevents distortion from such stresses after the machines are put in service. On the geared presses, all gears are also of welded steel construction, and are annealed before machining. The pinion-shafts are mounted in Timken roller bearings.

The frame, slide, and legs of the inclinable presses, one of which is illustrated in Fig. 2, are

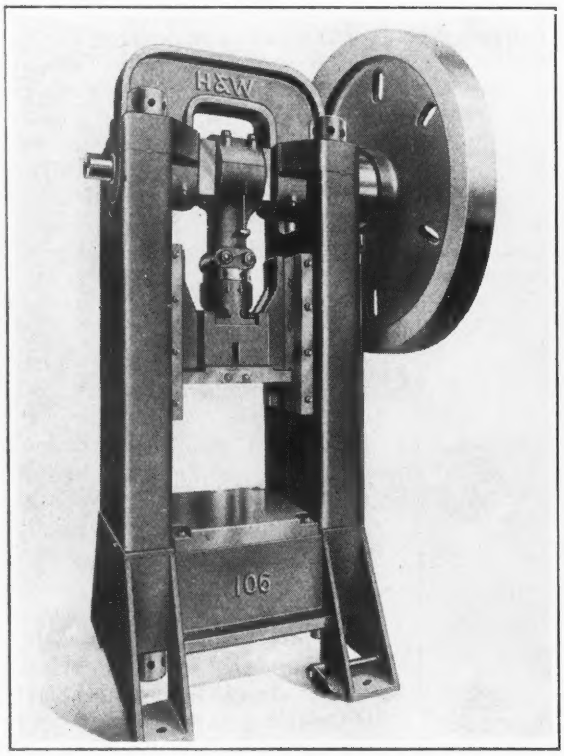


Fig. 1. Henry & Wright Straight-sided Press of All-steel Welded Construction

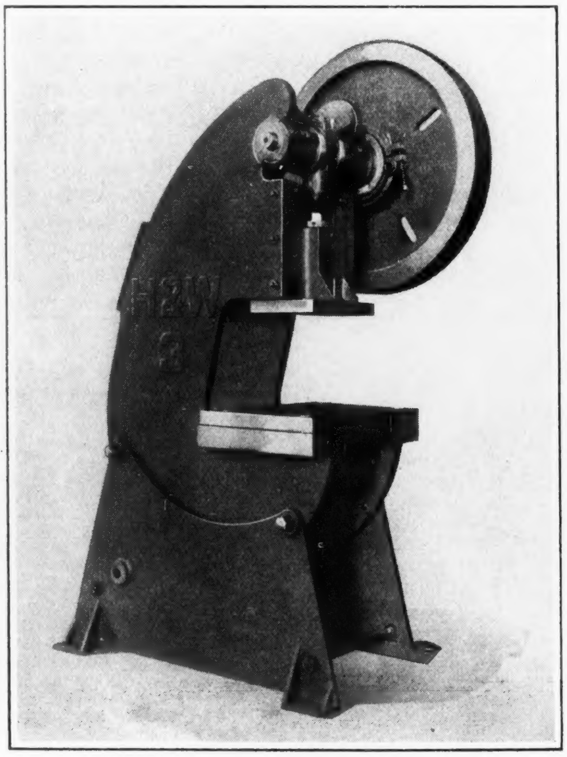


Fig. 2. Inclinable Press Made up of Fabricated Units Annealed before Machining

of welded steel construction. Geared presses of this type are also equipped with welded steel gears, and the various fabricated units are annealed before machining, as in the case of the straight-sided presses. The throat of the inclinable presses has been designed to give additional die space and to distribute stresses proportionately throughout the frame. Since no patterns are required for these machines, changes or modifications can be conveniently made to suit the requirements.

Pels Shearing, Notching, and Coping Machine

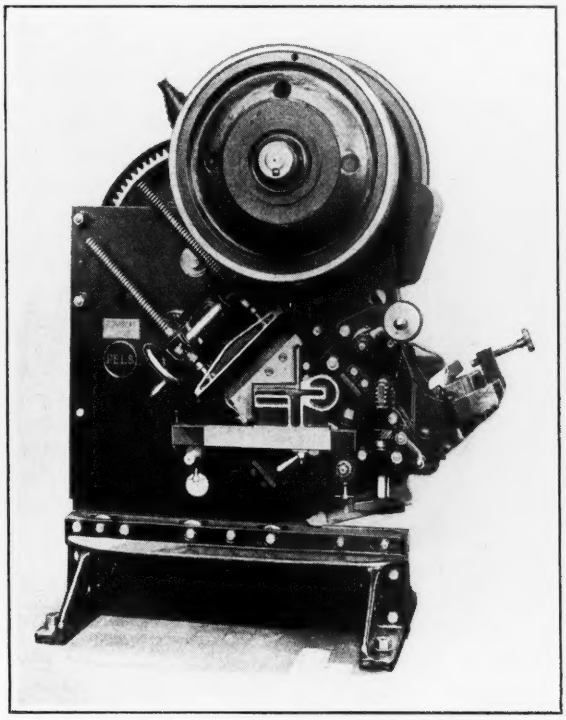
A machine designed for cutting angle-irons, T-irons, round, square, and flat bars, and plates, as well as for notching or coping operations, is being introduced on the market by Henry Pels & Co., Inc., 90 West St., New York City. This machine is intended primarily for use in shops where parts are welded together. It differs from the Type MAE combination punch and shear made by the company in that the punching end has been omitted. Apart from this, the new machine is exactly the same, in design, operation, and capacity, as the old one. The new machine is built in two sizes having weights of 3600 and 5150 pounds, respectively.

Electrical Sizing Device for Bryant Grinders

An electrical automatic sizing device that is not affected by wear of parts of the machine on which it is applied, has been developed by the Bryant Chucking Grinder Co., Springfield, Vt., for application to new machines of its manufacture or to machines already in use. This electrical device controls the size of work by means of a carbon washer mounted beside the grinding wheel and a sizing ring held in the chuck. These two elements make an electrical contact when the predetermined size of work has been reached and back off the feed a few thousandths of an inch so as to stop the grinding. Fig. 3 shows the arrangement of the sizing ring and carbon washer.

When the work has been ground to a predetermined size, magnetic switches close and cause a solenoid to be energized. These switches remain closed until the operator withdraws the slide from the grinding position, when they are automatically released. The solenoid acts first to disengage the feed pawl; second, to back off the wheel a few thousandths of an inch from the work; and third, to stop the feed-wheel after it has been backed off.

Grinding having been stopped, the operator withdraws the wheel to dress it or to chuck another piece. This operation automatically de-energizes the solenoid, but it is so latched that the parts do not resume the grinding position until the operator advances the feed-wheel by hand, after having positioned the grinding wheel for the operation. At this time, the voltage across the carbon washer and sizing ring is automatically changed in those cases where the device is



Pels Shearing Machine for Structural Shapes and Plates

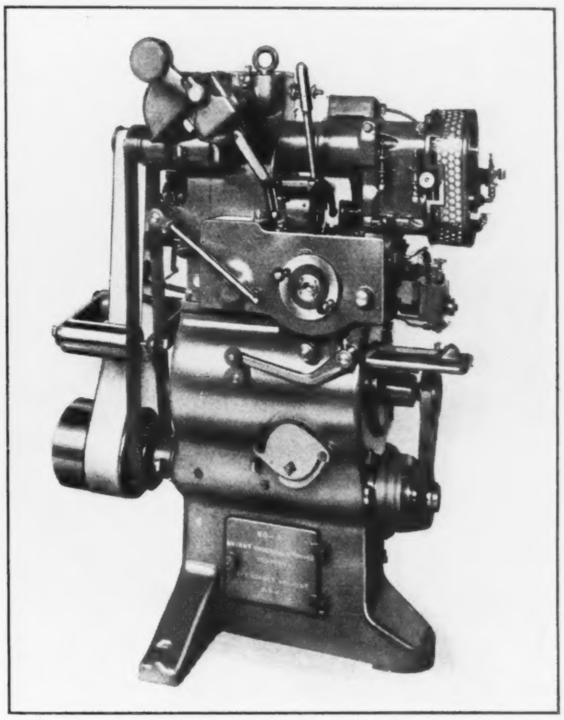


Fig. 1. Bryant Chucking Grinder with Electrical Sizing Device

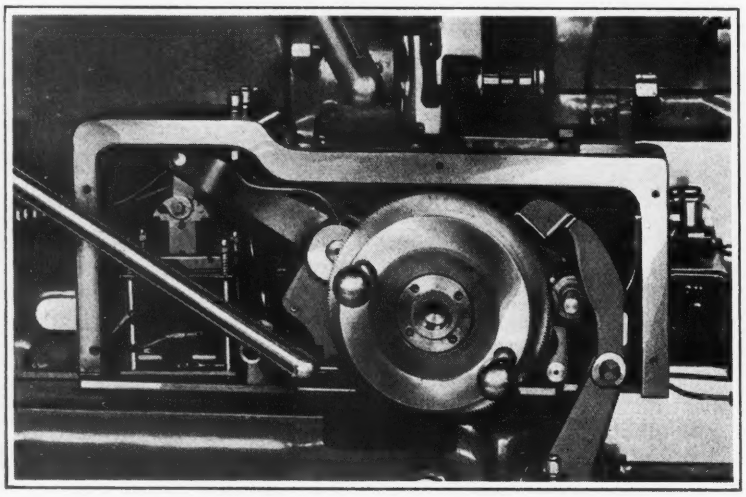


Fig. 2. Electrical Mechanism which Disengages Feed and Backs away Wheel when Correct Work Size is Obtained

used for knocking off at both rough and finished sizes. Obviously, this change is not made when the work is ground to the finished size in one operation.

As the carbon washer and wheel are mounted side by side, they are dressed to the same diameter by the diamond, and when the wheel is worn down slightly by contact with the work, the washer is also worn down. The sizing ring and work are grounded electrically through the chuck. The ring is easily replaced and forms a part of the backing spider, its design depending on the type of chuck used.

In order to prevent the feed from being knocked off by contact between the carbon washer and the work, auxiliary contacts are arranged to complete the circuit only when the carbon washer is in longitudinal alignment with the sizing ring. It is not necessary that actual physical contact be made between the carbon washer and sizing ring, and there is never contact between the wheel and this ring.

The use of different voltages makes it possible to knock off the feed at different work sizes. By using a relatively high voltage for rough-grinding, the feed is knocked off at the predetermined rough size. Then, after dressing the wheel, a lower voltage may be applied to cause the feed to knock off at the finished size. This change from one voltage to another can be made automatically or by hand. In order to prevent the device from being tripped by current leaking through the coolant, the magnetic switches are arranged to require a heavier current for operation than that which might leak through before the work reaches the predetermined size. The current is from 5 to 20 volts.

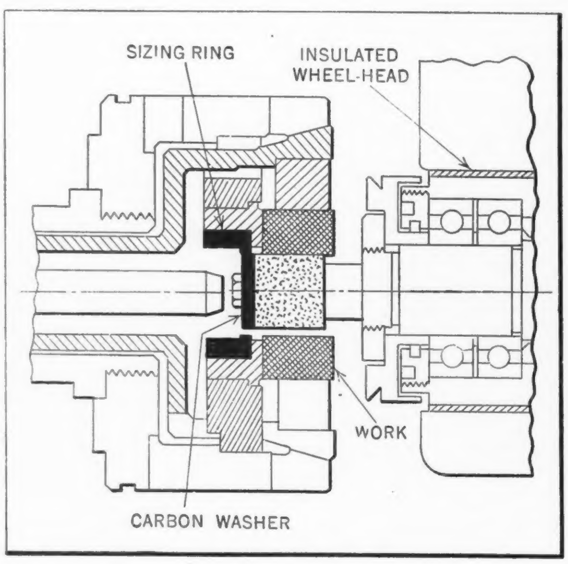


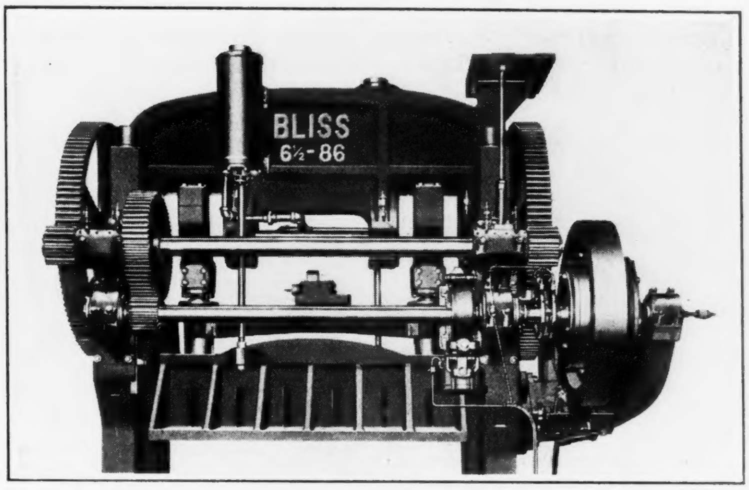
Fig. 3. Diagram Showing Arrangement of Carbon Washer and Sizing Ring

Bliss Magnetic Control for Clutches and Brakes

A new magnetic control for multiple-disk friction clutches and brakes applied to power presses has recently been designed by the E. W. Bliss Co., 53rd St. and Second Ave., Brooklyn, N. Y. The new clutch uses the same friction disks and plates as the standard mechanically operated clutch, but all operating links and levers are eliminated. The pull of the magnet is transmitted direct to the moving plate of the clutch and no thrust is transmitted to any bearing. Adjustments are made through a single threaded ring at the back of the friction plates. The magnetic brake is of the type used with manipulator and crane motors and is especially wound to suit press operating conditions.

This control equipment provides full automatic features and, in addition, when several operators are employed, safeguards all of them. On one side of the press is a cabinet containing a four-station transfer switch. Two start buttons and one emergency stop are furnished for each operator. The start buttons are of the lock-in type, which can be closed when the full number of operators is not employed. A foot switch can be provided for operation with all hand buttons locked in.

The four stations of the transfer switch give the following working conditions: First, with all hands on the start buttons, the clutch will engage and then, though the hands are removed, the press will complete one cycle and stop automatically with the slide at the top of the stroke; second, after the press is started, it runs continuously until stopped by depressing any of the stop buttons; and third, the press can be "inched" as long as a separate button is held depressed. The fourth condition is



Bliss Power Press with Friction Clutch and Brake Controlled Magnetically

similar to the first, with the exception that all buttons must be held until the slide reaches the bottom of its stroke. This insures safety on slow-running presses where an operator might attempt to adjust the work on the die after the slide had started on the down stroke.

Blowpipe with Detachable Valve Body

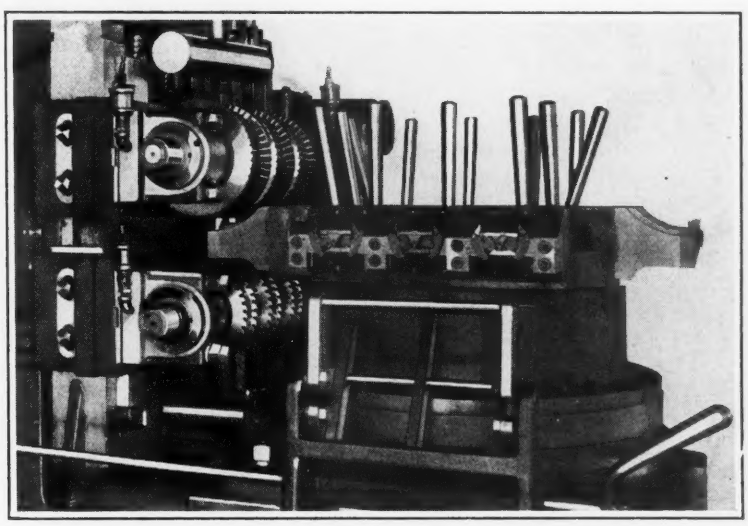
A blowpipe with a detachable valve body to which the handle is secured by a simple locking device that enables the operator to change quickly from the standard handle to different styles without detaching the hose or hose connections and without the use of a wrench has recently been added to the equipment made by the Linde Air Products Co., 30 E. 42nd St., New York City. This blowpipe is made in two sizes, the larger size being adapted for welding work ranging from the lightest sheet metal to heavy work requiring a No. 13 welding tip. Ten different sizes of tips ranging from No. 4 to 13, inclusive, are available for this size. The smaller blowpipe is supplied with five sizes of tips ranging from No. 3 to 7, inclusive. This blowpipe is particularly suited for automobile repair shops and for general light welding, bronze welding of small parts, and soldering.

Producto-Matic Automatic Indexing Fixture

Clearance and rake on inserted teeth for circular saws and the abutting end of the teeth are milled simultaneously at the rate of 750 teeth per hour by means of an automatic indexing fixture developed by the Producto Machine Co., Bridgeport, Conn. This fixture is used on the No. 55 Producto-Matic described in February MACHINERY, page 466. Teeth of twenty-seven different sizes can be milled in the fixture through the provision of interchangeable clamping jaws. Except for the loading and ejecting of the work, the machine and the fixture are entirely automatic.

The indexing fixture is of the four-station turret type. Six inserted saw teeth are clamped in each station by means of individual hand-levers as the stations come into position opposite the operator. Before a station is loaded, however, the teeth already milled at that station are ejected from the turret by a set of six fingers, which are pivoted to a bracket bolted to the machine frame and operated manually.

Although designed primarily for saw teeth, this fixture can be adapted, with some modifications, for handling different types of work.



Turret Fixture for Milling Saw Teeth in a Producto-Matic

Forged "Crestoloy" Steel Wrenches

Three sizes of adjustable wrenches having capacities of 3/4, 15/16, and 1 1/8 inches, and lengths of 6, 8, and 10 inches, respectively, have been placed on the market by the Crescent Tool Co., Jamestown, N. Y. It is claimed that these wrenches will stand a strain of more than twice that required to break the regular Crescent wrenches made by this company, yet the new wrenches are one-third thinner, much lighter, and easier to handle than the previous design.

The "Crestoloy" steel used

in these wrenches, which is responsible for their greater strength, has been developed by this company's experimental department, working in conjunction with other metallurgists.

American Lathe of Double-end Construction

A lathe has recently been built by the American Tool Works Co., Cincinnati, Ohio, for the U. S. Navy Yard at Bremerton, Wash., which has a capacity for machining propeller shafts up to 60 feet long. This lathe has a swing of 42 inches and an over-all length of 80 feet. However, as the lathe will be used on propeller shaft work only a small percentage of the time, it was desirable to provide some means of making full use of the long bed during what would otherwise be idle time for a considerable portion of the bed length.

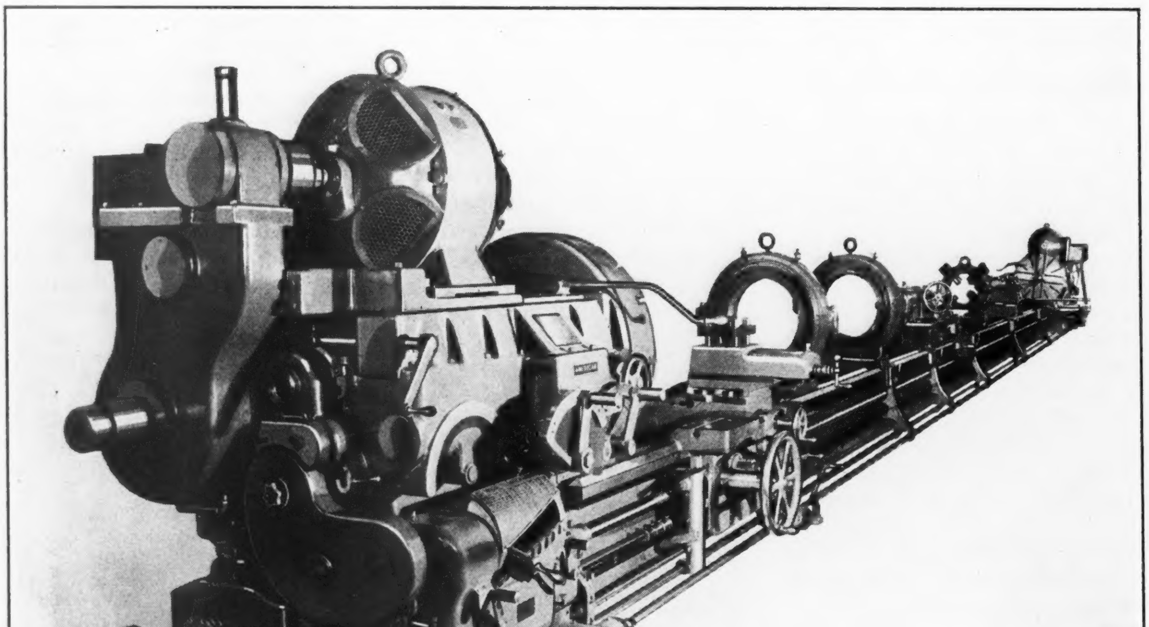
The decision was made, therefore, to mount on the tailstock end of the bed a set of elements similar to those on the headstock end. Consequently, as will be apparent from the illustration, this machine really comprises two complete engine lathes on one bed.

When the maximum center-to-center distance of 61 feet is required, the right-hand carriage and tailstock are moved to the extreme right-hand end of the bed. The right-hand head is then out of commission, except for chucking work requiring only a very limited carriage movement.

When each end of the lathe is used separately, the head, carriage, tailstock, feed and screw-cutting mechanism, and carriage power traverse of each lathe operate independently. In other words, two distinct 42-inch lathes are provided, in which every function of each lathe is as independent of the other as if two separate beds were used.

Each carriage is complete with a taper attachment, power angular feed to the compound rest, and all other standard equipment. A rapid power traverse mechanism, controlled at the apron, is also furnished for each carriage. These power rapid traverse mechanisms are driven by separate motors which are located at corresponding ends of the bed.

The heads are of the internal-geared faceplate-driven type. Eighteen mechanical speed changes are available, twelve of which are transmitted through the faceplate drive. Each head is driven by a 30-horsepower adjustable-speed motor having a speed range of from 500 to 1500 revolutions per minute. The variation of motor speeds at the corresponding carriage is accomplished through the handwheel at the right-hand end of the apron. This control gives instantaneous variation of the spindle speed within the 3 to 1



Eighty-foot Lathe which can be Used for Work 60 Feet Long and also as Two Distinct Machines on Shorter Work

range of the motor for each of the mechanical speed changes. The weight of this double-end lathe, complete with all equipment, is approximately 100,000 pounds.

Toledo Cold-Forging and Stamping Press

A press particularly adapted for extruding valve heads, coining the covers on globe valves, and performing forging, forming, and stamping operations has just been completed by the Toledo Machine & Tool Co., Toledo, Ohio. This machine weighs about 85,000 pounds. The crankshaft is of the semi-eccentric type and will exert a pressure of 500 tons at the bottom of the stroke.

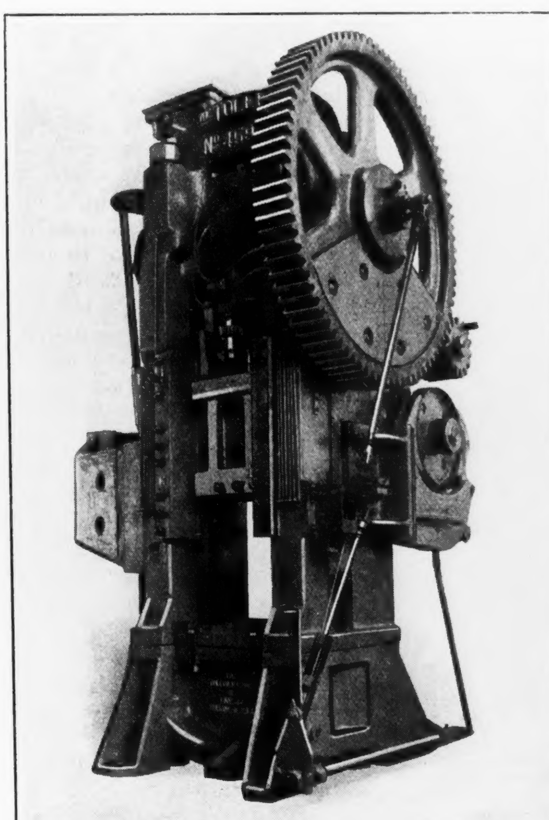
One of the important features is the double-geared arrangement of the press, there being an extra pinion on the drive shaft and an extra gear on the intermediate shaft. This design gives two gear ratios of 8 to 1 and 20 to 1 for operating the press at either twelve or thirty strokes per minute. Changes in the gear ratio are made somewhat the same as on an automobile.

The clutch is of an improved multiple-disk friction type. It is mounted in the flywheel on Timken roller bearings. The brake is located at the extreme other end of the shaft so as to eliminate heating of the clutch due to braking. The clutch control mechanism is of a new design, so arranged that the press can be operated by either a foot- or a hand-lever. Through a simple adjustment, the press can be made to run continuously or to stop automatically at the top center. It may also be stopped instantly at any point of the stroke, which is particularly advantageous when dies are being set up. A cam-actuated lift-out raises the work from the die after the operation. A centralized system lubricates all main bearings from the floor.

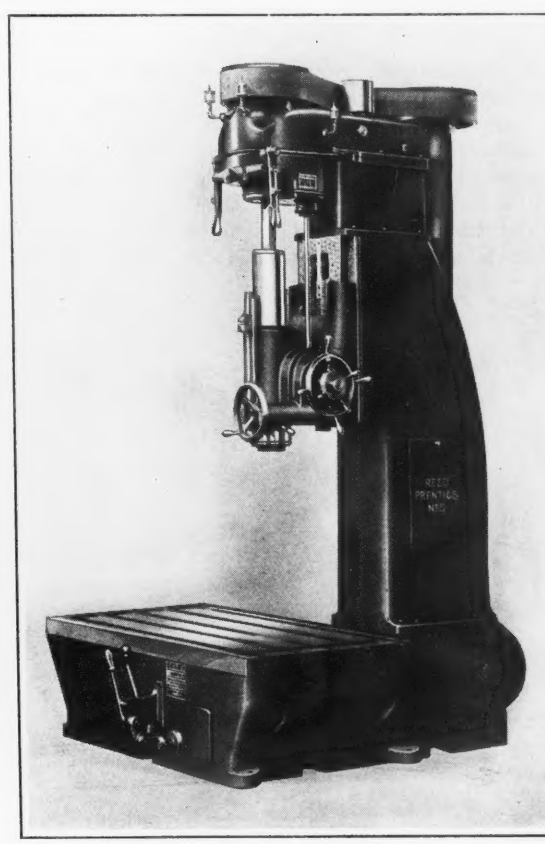
The press is driven by a 30-horsepower motor through a pulley connected to the flywheel by means of a belt. The slide of this machine measures 24 by 26 1/2 inches, and the bed 32 by 33 inches. The stroke is 12 inches, and the distance from the top of the bolster to the under face of the slide, with the stroke down and the adjustment up, is 28 inches. Any of these dimensions can be changed.

Reed-Prentice Special Jig Boring Machine

The vertical jig boring machine here illustrated is especially adapted for boring the top and bottom sections of cast-iron sub-presses on which punches and dies are to be mounted for blank-



Toledo Press Designed for Extruding, Coining, Forging, Forming and Stamping



Reed-Prentice Jig Boring Machine Especially Adapted to Boring Cast-iron Sub-presses

ing and piercing laminations. This machine is a recent development of the Reed-Prentice Corporation, Worcester, Mass. As this equipment is intended for boring only, it is provided with a solid base instead of a sliding saddle and table, but in other respects, it is similar to the No. 5 jig boring and vertical milling machine described in October and November, 1929, MACHINERY, page 103 and 256, respectively.

Eighteen spindle speeds ranging from 25 to 900 revolutions per minute, and feeds of 0.005, 0.010, and 0.020 inch per spindle revolution are available. There are 15 inches of power feed. The throat depth is 20 inches, and the maximum distance from the spindle to the table, 39 inches. The solid box table shown in the illustration measures 36 by 70 inches. Timken tapered roller bearings are furnished throughout the machine.

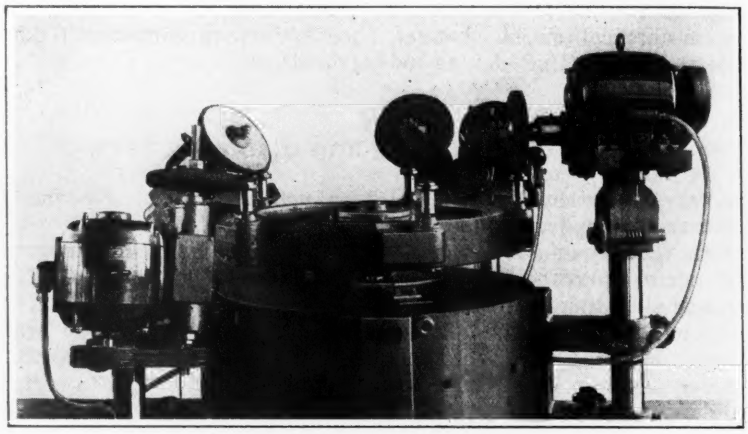


Fig. 2. Wheels Set up in Four Different Planes for Polishing Circular Caps

Oliver Double-spindle Wood Shaper

A high-speed wood shaper similar to the machine described in December MACHINERY, page 319, except that it has two spindles, has been placed on the market by the Oliver Machinery Co., Grand Rapids, Mich. This machine is especially adapted for heavy-duty, automobile-body or pattern-shop work. It is equipped with large cutter-heads and special overhead bearing supports. Each spindle is driven at a speed of 7200 revolutions per minute by a V-belt drive from a vertical five-horsepower, ball-bearing motor which runs at a speed of 3600 revolutions per minute. The center-to-center distance between the spindles is 24 inches, and the dimensions of the table are 66 by 36 inches.

Hammond Universal Automatic Polishing and Buffing Machine

An automatic polishing and buffing machine that is universal in application because it can be employed for polishing a variety of shapes, in small or large lots, has been developed by Hammond Machinery Builders, Inc., Kalamazoo, Mich. Figs. 1, 2, and 3 show three typical set-ups and illustrate the flexibility of the machine. It may be of full- or semi-automatic design. The advantages claimed over hand machines are greater production per man hour and a more uniform finish on successive parts.

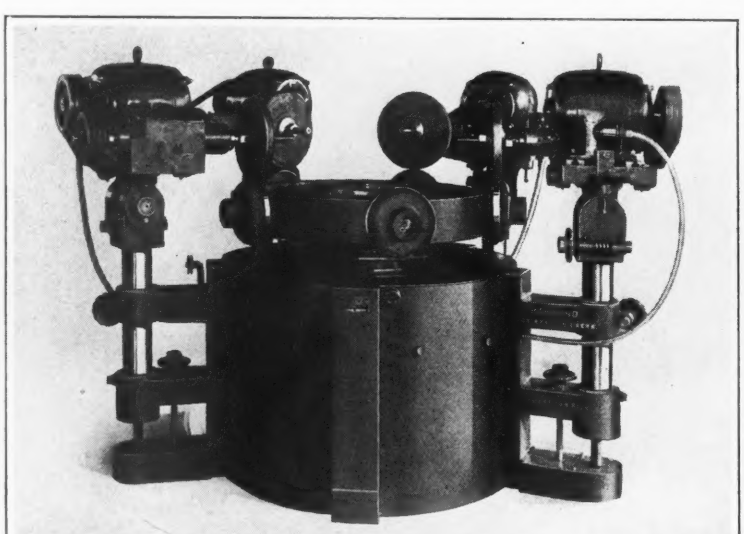


Fig. 1. Hammond Automatic Polishing and Buffing Machine Set up for Work Rotated on a Horizontal Axis

Means are incorporated in the machine so that whether the work to be polished is round, flat, or beveled, the desired finish can be obtained by the use of simple holders that present the work to the face of the wheels. Should the work require a revolving motion about a horizontal axis, an arrangement such as shown in Fig. 1 can be provided.

Fig. 2 illustrates a set-up for a circular cap that requires four different positions of the polishing wheels. The first wheel on the left polishes a vertical cylindrical surface, the second a 20-degree bevel, the third a 90-degree corner, and the fourth a flat horizontal surface. All these operations are performed with one type of adapter and one handling of the work. The polishing heads are adjustable to

any angular position from the horizontal to the vertical.

Flat iron bases are polished with the set-up illustrated in Fig. 3. The polishing is done by the reciprocation of work-holding platens beneath the polishing wheels in the various indexed positions of the table. A groove in the platens provides for readily clamping various adapters. The polishing wheels are pivoted radially relative to the center of the machine.

In each of the set-ups illustrated, the table is indexed to the different polishing heads and to the operator's station. At the latter point, each fixture is automatically stopped to prevent injury to the operator while reloading. The table can also be arranged to revolve continuously.

Correct positioning of the work against the wheel faces is easily maintained through the design of the work fixtures. The yield or "giving" effect of human hands in hand-polishing is obtained in this machine through the provision of a spring balance for the polishing heads. Any predetermined pressure or yield may be obtained. The spring adjustment of each head is made by means of a long vertical screw at the rear of the motor.

Any desired feed of the work past the wheels is obtained through differential gearing. Wheel faces can be redressed with composition at proper intervals, either manually or automatically. The production varies with the class of work, and is controlled only by the time required for the actual polishing. The table can be operated to produce up to 2000 pieces per hour, a six- or seven-spindle machine being used for the high outputs.

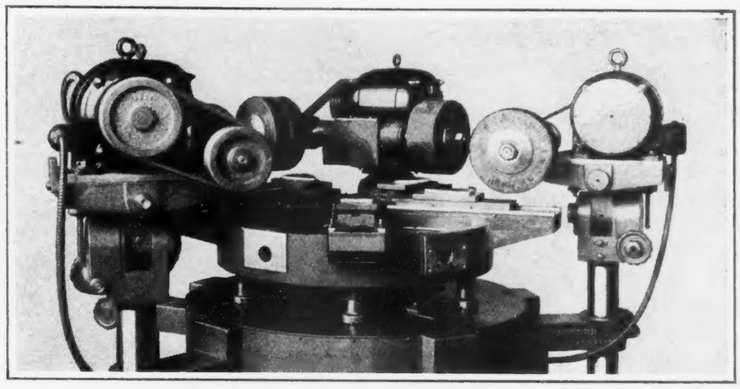
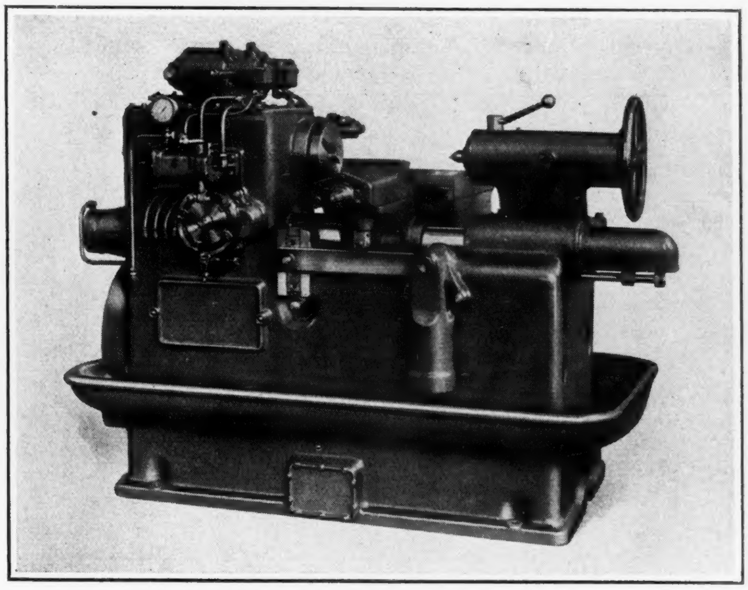


Fig. 3. Table Design that Provides for Reciprocating the Work under the Polishing Wheels

The polishing wheel spindles are driven through multiple V-belts, and their speed can be varied by using different sheave diameters. The spindle bearings have a self-contained oscillating feature which may be thrown in or out by means of a lever. Anti-friction bearings are provided throughout the machine. Safety start and stop buttons are located at both the front and rear.

Barnes Automatic Lathe with "Multi-Range" Hydraulic Feed

The automatic lathe with hydraulic feed now being placed on the market by the John S. Barnes Corporation, Rockford, Ill., is intended for smaller work than the machine described in May, 1930, MACHINERY, page 723. This new No. 12 lathe has a swing of 13 inches, the maximum distance between centers is 18 inches, the diameter of hole in spindle is 1 1/4 inches and the weight is 5250 pounds. The headstock, bed, and base are made in a single casting to eliminate vibration and maintain alignment. The "Multi-Range" hydraulic feed is obtained by pumps driven from the main spindle. Pressure for the rapid traverse is supplied by a separate pump, all of these pumps being of Barnes manufacture. The rapid traverse is controlled by a single lever, and the speed and feed mechanisms operate in response to the rapid traverse.

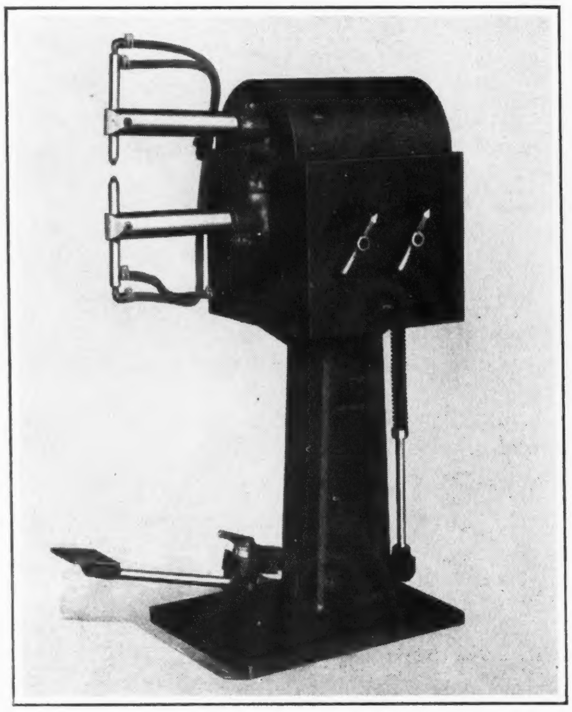


Barnes Small-sized Automatic Lathe with Hydraulic Carriage Feeds Lengthwise and Crosswise

Feeds ranging from 0.001 to 0.100 inch per revolution of the main spindle are available, the feeds of the two carriages being entirely independent. Dials pro-

vided for setting the carriage feeds are graduated in thousandths of an inch.

High spindle speeds provide for using tungsten-carbide tools. Speed changes are made by means of pick-off gears. Herringbone gears drive the spindle, which is mounted in anti-friction bearings and rotates clockwise, the same as on the No. 17 automatic lathe. This design places the full load on the bed.



Lenney Light-duty Light-weight Spot-Welder

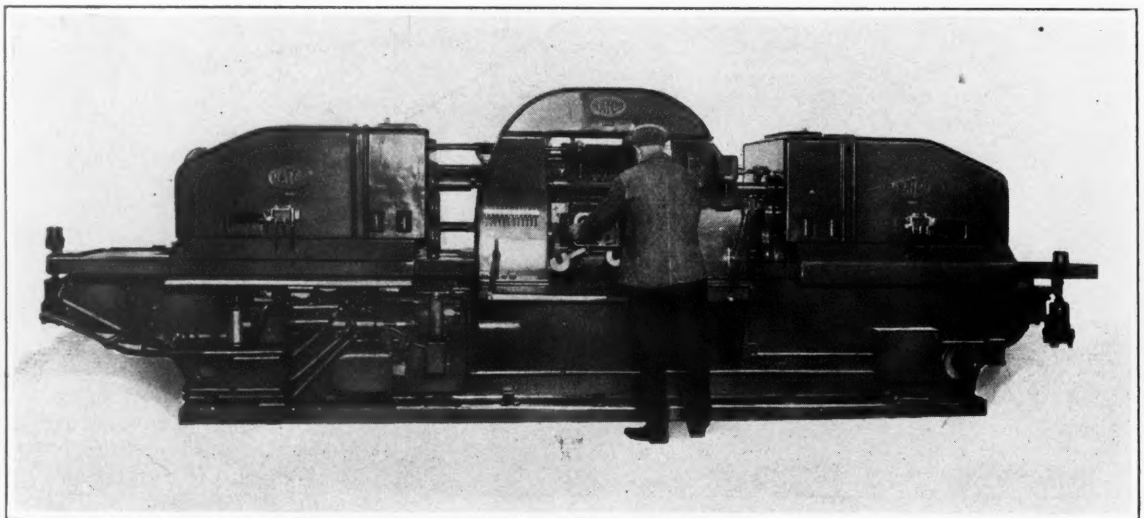
Lenney "Midget" Spot-Welder

A light-duty, light-weight spot-welder designated the "Midget" has been added to the line of "Standard" welding machines built by the Lenney Machine & Mfg. Co., Warren, Ohio. This machine has a continuous capacity for welding together two pieces of No. 16 gage stock, and intermittent capacity for welding two pieces of 1/8-inch stock. It is of compact design, requiring only 16 by 22 inches of floor space for the 12-inch throat. The capacity of the transformer is 7 1/2 kilovolt-amperes. The machine is provided with a six-step regulation, a swivel-treadle, and water-cooled points. It is intended to cover the entire range of work handled in small shops.

Natco Two-way Hydraulic Drilling Machine

The two-way horizontal hydraulic drilling machine here illustrated was built recently by the National Automatic Tool Co., Richmond, Ind., for drilling the camshaft holes in automobile cylinder blocks. Two horizontal sliding heads are mounted on a single-piece bed. The machine is fully automatic in operation, including the indexing of the trunnion fixture and the clamping and releasing of the work pieces. Thus it is only necessary for the operator to slide the pieces in and out of the fixture.

Hydraulic pressure for moving the heads and indexing the fixture is supplied by a pump driven by a 10-horsepower motor through a silent chain. The right-hand head has a thrust of approximately 20,000 pounds and a travel of 21 inches. It is equipped with a fixed-center gear-driven cluster box containing four heavy-duty spindles. These spindles are 3 1/4 inches in diameter, and have a nose adjustment and roller bearings. They are driven by a 15-horsepower constant-speed motor. The left-hand head is identical with the right-hand head except that it has a travel of 25 inches. The six-position, roller-bearing, trunnion type of fixture is indexed mechanically by the movement of the left-hand head.



Natco Two-way Machine for Drilling Camshaft Holes in Automobile Cylinder Blocks

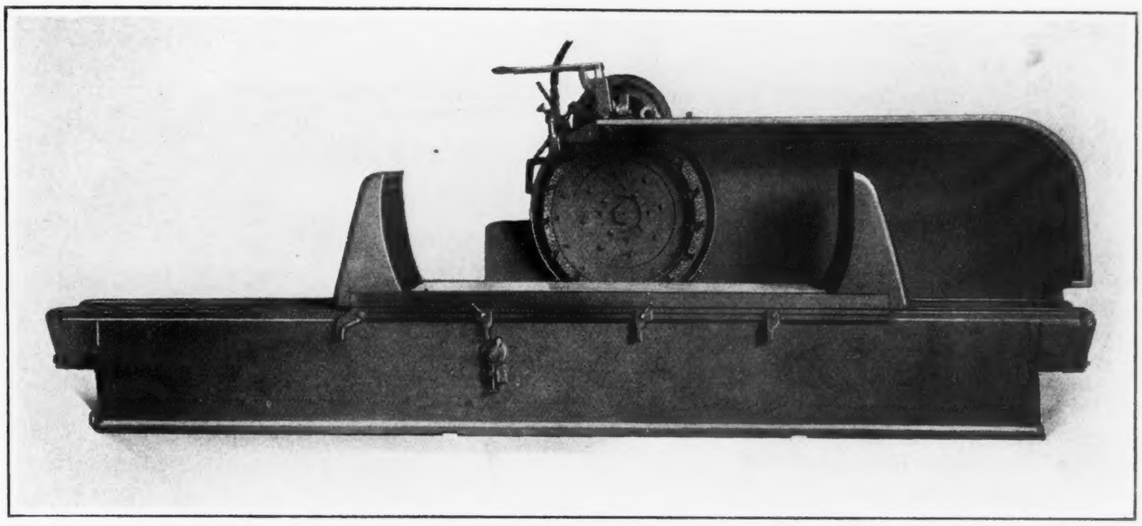


Fig. 1. Hanchett Face Grinding Machine with Hydraulically Operated Table and Grinding Wheel

Hanchett Hydraulically Operated Face Grinding Machines

A series of face grinding machines in which the work-table or platen is operated hydraulically is being placed on the market by the Hanchett Mfg. Co., Big Rapids, Mich. In Fig. 2 may be seen the mechanism that controls the table speeds, which range from 0 to 90 feet per minute on standard machines. This speed range can be increased to from 0 to 160 feet per minute to meet requirements. The various levers of the control for starting, stopping, or reversing the table and for instantly changing its speed are conveniently located.

The oil-pump unit for the hydraulic system is mounted on a plate, so that it can be easily removed from within the machine bed. A 7 1/2-horsepower motor furnishes the power for driving this unit. A foot-pedal is operated to "by-pass" dogs for running the table to the safety dogs, when it is desired to reload or inspect work.

The grinding-wheel head is also operated hydraulically, automatic feeds ranging from 0.00025 to 0.005 inch per table stroke being available. An independent hand cross-feed is also supplied.

Another feature of these grinders is the precaution taken to eliminate wear of the ways and to provide effective lubrication. From Fig. 2 it will be seen that the ways are covered by heavy fabric belts which are connected to each end of the table, pass over pulleys at the ends of the bed, and extend through the bed. A forced feed system supplies adequate lubricant to the ways. The lubricant drains into channels from the ways and passes through a Purolator system for cleaning before being returned to the pump.

The No. 984 machine illustrated is regularly provided with

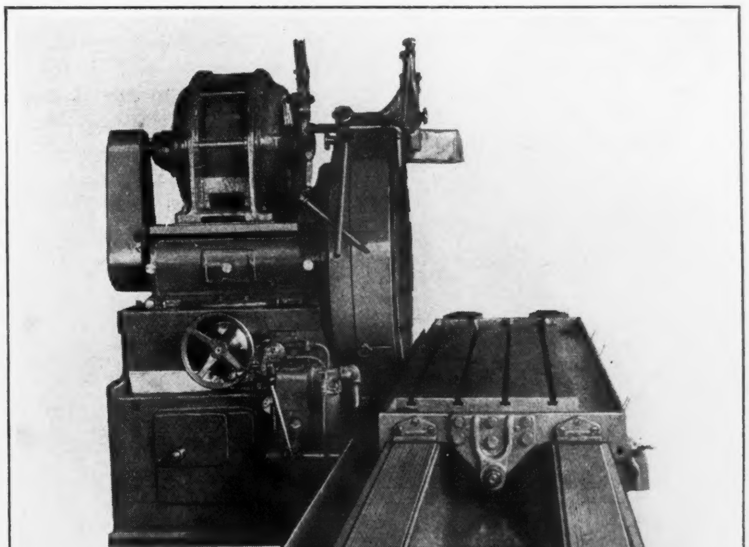
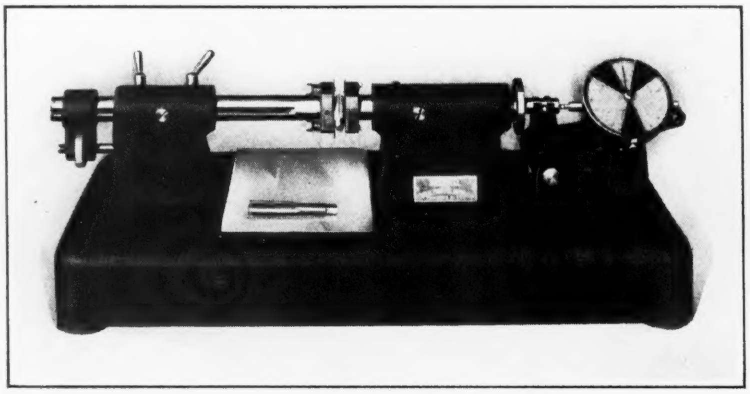


Fig. 2. Fabric Belts Connected to Each End of the Table Protect the Bed Ways

a 36-inch diameter segmental-wheel chuck, and is driven through a silent chain by a 40-horsepower motor. The wheel-spindle is equipped with a brake so that it can be stopped quickly when the power is shut off. Radial and thrust ball bearings carry the spindle. Two outlets discharge coolant on the grinding wheel and on the work from a 75-gallon tank.

The ways of the bed and their center-to-center distance have been made unusually wide, and the bed is of such a length that the table never overhangs. These machines are made in various lengths ranging from 50 to 192 inches. The approximate weight of the machine illustrated, including the motors, chuck, wheels, and wet grinding system, is about 18,500 pounds.



Federal Gage for Checking Thread Sizes by the Three-wire Method

Federal Gage for Checking Thread Sizes

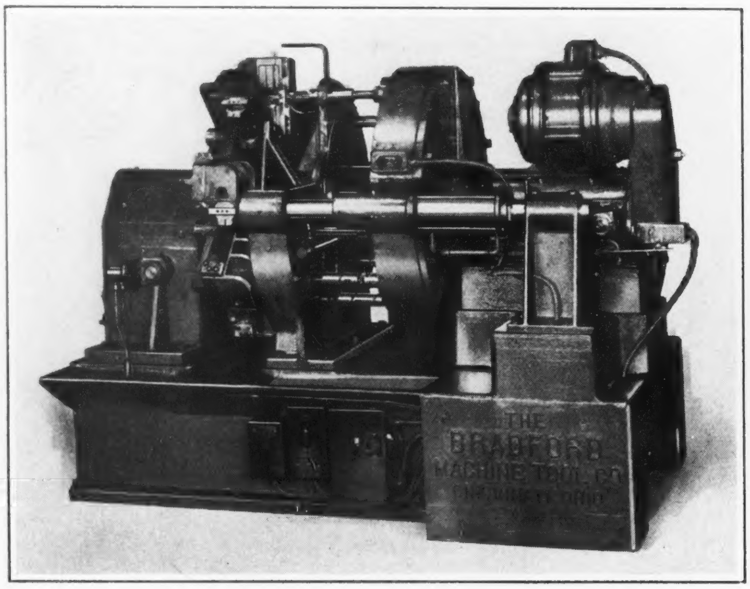
A dial indicator and means for conveniently applying the three-wire method of measuring threads constitute the basic elements of a gage recently placed on the market by the Federal Products Corporation, 1144 Eddy St., Providence, R. I. This gage is intended for checking the size of taps, screws, thread gages, and other threaded products. The general design of the gage was developed by the engineers of the J. M. Carpenter Tap & Die Co., Pawtucket, R. I.

The dial indicator of the gage is graduated to 0.0001 inch and is 3 5/8 inches in diameter. It is equipped with a tolerance shutter to facilitate reading to 0.0001 inch or closer.

The three-wire method of measuring is so applied that the individual wire is allowed to float, while the two opposite wires are held in a semi-floating position. The spring pressure against the part to be gaged can be adjusted from 1/2 to 6 pounds. Provision is made for instantly changing the gage to accommodate threads of different sizes. Work can be checked in either a vertical or a horizontal position as desired. The tailstock of the gage is provided with a vernier adjustment.

Bradford Drilling, Reaming and Facing Machine

An automatic horizontal drilling machine developed by the Bradford Machine Tool Co., 657 Evans St., Cincinnati, Ohio, for drilling, taper-reaming, and facing the end of the socket on a golf-club iron is shown in the accompanying illustration. The new machine consists of a standard Bradford automatic drill unit equipped with a seven-spindle drill head in which the tools are spaced around a circle 24 inches in diameter. This multiple-spindle head is arranged to work in conjunction with an eight-station ferris-wheel type of drum.



Bradford Machine Designed Primarily for Drilling, Reaming, and Facing Golf-club Heads

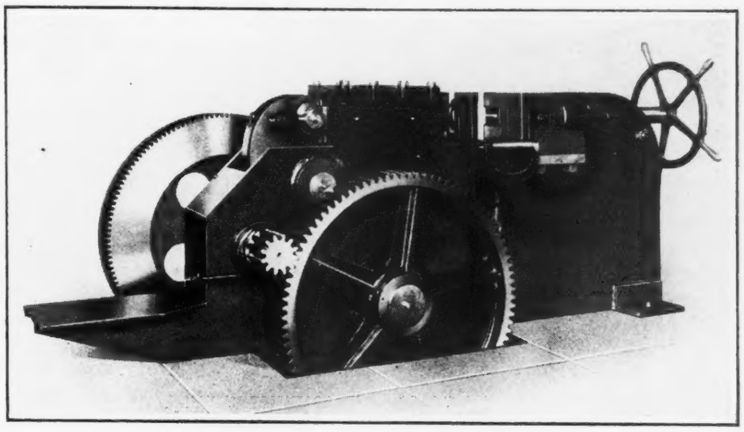
The fixture at each station consists of an equalizing two-jaw chuck which can be adjusted in six different directions to compensate for variations in the different designs and sizes of golf-club irons. All functions of the machine are fully automatic, it only being necessary for the operator to load and unload the fixtures.

The machine is controlled by the motor that operates the index movement. This motor is mounted at the back, and is connected to the index control by means of a spur gear and a

worm-gear drive which rotates the control camshaft. The indexing movement requires one second, the cam being designed to accelerate the speed of the drum at the beginning of the indexing movement and decelerate the speed at the end without any perceptible shock.

As the indexing movement is completed, an auxiliary cam actuates a single-acting air control valve at the left front of the machine. This causes the feeding mechanism of the drill unit to be thrown into engagement, after which the spindles advance rapidly for a distance of 2 1/2 inches, slow down to a feed of 0.008 inch per revolution, and then return rapidly to the starting point. The machine is timed to operate on a cycle of 10 1/2 seconds, but the actual time required for loading and unloading the fixture is less than six seconds. A safety device stops the machine in case the tools should become excessively dull or anything should interfere with the regular forward movement of the head.

When the machine is in operation, the ferris-wheel drum is totally enclosed by suitable splash guards (not shown in the illustration). While this machine is shown tooled up for golf-club irons, it can be adapted for producing any part requiring similar operations.



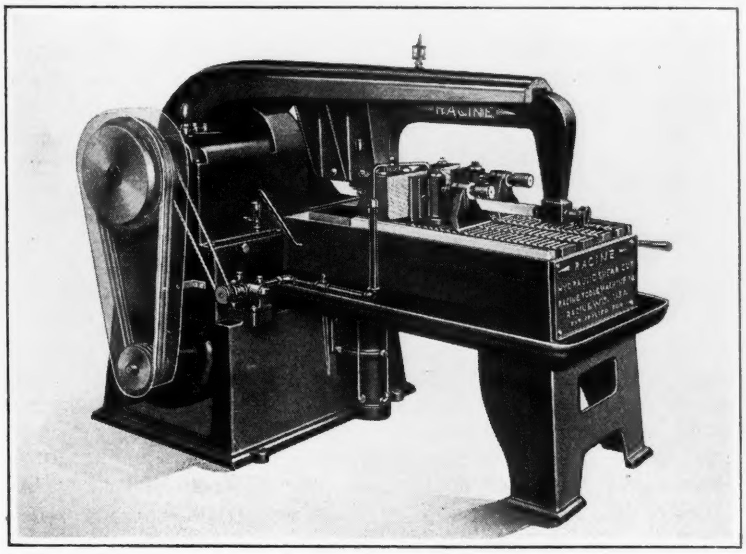
"Armor Plate" Machine Intended for Straightening Axles, Rails, and Structural Steel Shapes

Buffalo "Armor Plate" Straightening Machines

Machines of the construction illustrated have recently been developed by the Buffalo Forge Co., Buffalo, N. Y., for straightening such work as axles, rails, and structural beams, channels, and tees. These machines are designed along the lines of horizontal punches. They are equipped with lower pressure blocks, which are adjusted by means of a handwheel and which move in unison to insure equal spacing. The carriage is graduated and capacity tables are furnished to indicate what sections may be bent on any given centers. The carriage is adjusted by means of a large handwheel and screw. Operation of the machine is continuous.

The plunger slides between the frames and is gibbed on both sides. The standard shape of the three pressure blocks may be changed to meet special conditions. Rollers facilitate the handling of different materials through the machine.

These machines are of "Armor Plate" electrically welded frame construction. They are built in three sizes having ram pressures of 80, 130, and 190 tons, respectively. The weights are 6850, 11,000, and 16,500 pounds.



Racine Metal-cutting Machine of Improved Design

Racine Improved Hydraulic Metal-cutting Machine

One of the features of an improved metal-cutting machine built by the Racine Tool & Machine Co., 1752 State St., Racine, Wis., is a hydraulic knock-out, which disengages the clutch and reverses the control valve of the machine at the end of the cutting stroke, so as to return the frame to the top position. The previous model of this machine was described in the June, 1930, number of MACHINERY, page 825.

Another important improvement in the hydraulic system is that all operating functions of the machine are now controlled through a single lever. A new pump case has been designed for

the hydraulic unit, and the governor control of this unit has been changed. A new saw guide provides a much wider bearing surface for the ways of the saw frame.

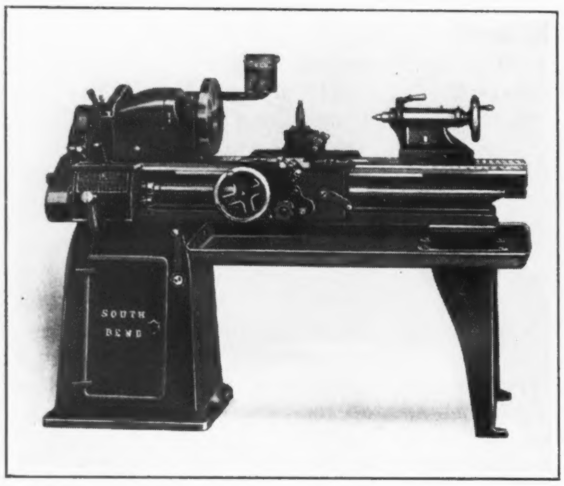
Hydraulically operated metal-cutting machines are now made by the company in 10- by 10-, 12- by 12-, and 10- by 16-inch capacities. They are provided with "Oilmotor" variable-displacement constant-pressure pumps made by the same company.

South Bend Lathe with Underneath Drive

The underneath-belt motor-driven lathe shown in the accompanying illustration has been placed on the market in 9-, 11-, 13-, 15-, 16- and 18-inch swings by the South Bend Lathe Works, 723 E. Madison St., South Bend, Ind. This new line is known as the Series N precision lathes, and has been designed for fine precision work in the tool-room, as well as for all classes of machine shop use. A double-wall apron, a hardened steel headstock spindle, and a reinforced bed of a new semi-steel are features.

The underneath drive is entirely enclosed, and consists of a reversing motor with a V-belt drive to a four-step cone pulley from which a flat belt transmits power to the cone pulley of the headstock spindle. The belt is shifted by placing the motor switch in neutral, raising the headstock cover, and giving the belt release lever a half turn to the left to move the lower cone pulley 2 1/2 inches vertically and thus release the tension on the belt, which is then easily placed on the desired step.

These lathes are made in the quick-change gear type, with a full quick-change mechanism for automatic feeds and for cutting right- or left-hand screw threads having from 2 to 112 threads per inch, including pipe threads of 11 1/2 per inch. They are also made in the standard change-gear type, equipped with change-gears for automatic feeds and for cutting right- or left-hand screw threads from 4 to 40 per inch, including pipe threads.



South Bend Lathe with Underneath-belt Motor Drive

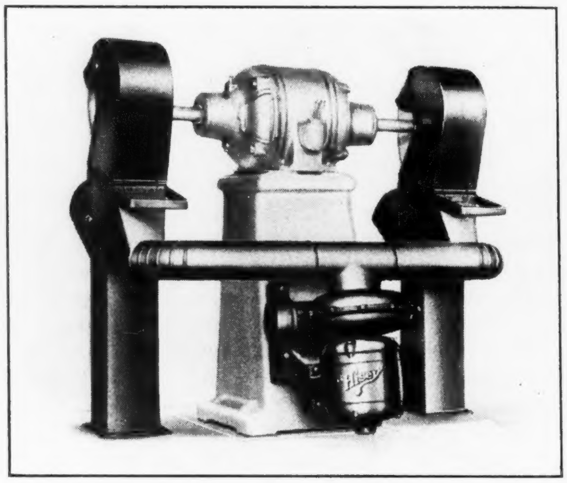
Ball Bearings with Wide Inner Ring

The "Wide-Inner" single-row bearings recently placed on the market by Standard Steel & Bearings, Inc., Plainville, Conn., are of exactly the same design and dimensions as the regular single-row maximum capacity bearings made by this company, except that the inner ring has the same width as in double-row bearings of corresponding sizes. The additional width of the inner ring permits the bearing to be used without a lock-nut.

This type of bearing is recommended for use in electric motors and for other applications where only a locating or nominal thrust is present.

Hisey-Wolf Exhauster Equipment

Buffing and polishing machines built by the Hisey-Wolf Machine Co., Cincinnati, Ohio, may now be provided with exhauster equipment, as shown in the accompanying illustration. This equipment is provided with a ball-bearing motor drive, which is controlled by the same automatic motor starter that controls the main driving motor of the machine.



Exhauster for Hisey-Wolf Buffing and Polishing Machines

Lincoln Electrode for Stainless Steel

An electrode for use in arc-welding stainless steel, which is known as the improved "Stainweld A," is being manufactured by the Lincoln Electric Co., Cleveland, Ohio. This electrode is made in 3/32-, 1/8-, 5/32-, 3/16-, and 1/4-inch sizes and in the regular 11-inch lengths. Im-

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INDEXING MOVEMENTS FOR ANGLES—7*

Angle in Degrees, Minutes, and Seconds			B. & S., Becker, K. & T., Hendey, and Rockford		Cincinnati and LeBlond		Angle in Degrees, Minutes, and Seconds			B. & S., Becker, K. & T., Hendey, and Rockford		Cincinnati and LeBlond	
Deg.	Min.	Sec.	No. of Holes	Circle	No. of Holes	Circle	Deg.	Min.	Sec.	No. of Holes	Circle	No. of Holes	Circle
5	6	0	..	..	17	30	5	35	27.2	..	..	41	66
5	6	29.1	21	37	21	37	5	35	40.5	23	37	23	37
5	7	3.5	..	..	29	51	5	36	13.5	..	..	33	53
5	7	14.4	..	..	33	58	5	37	30.0	10	16	15	24
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5	10	54.5	19	33	38	66	5	39	40.6	..	..	39	62
5	11	11.1	..	..	34	59	5	40	0	17	27	34	54
5	12	37.9	11	19	33	57	5	40	26.0	..	..	29	46
5	13	32.9	18	31	36	62	5	41	3.1	12	19	36	57
5	13	57.2	25	43	25	43	5	41	38.0	31	49	31	49
5	15	0	..	..	14	24	5	42	0	..	..	19	30
5	15	50.9	..	..	31	53	5	42	26.3	26	41	26	41
5	16	5.8	24	41	24	41	5	43	38.1	21	33	42	66
5	16	33.1	17	29	34	58	5	44	29.0	..	..	37	58
5	16	57.3	..	..	27	46	5	44	40.8	30	47	30	47
5	17	38.8	10	17	30	51	5	45	36.0	..	..	16	25
5	18	27.6	23	39	23	39	5	46	9.2	25	39	25	39
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5	22	6.3	..	..	34	57	5	50	31.5	..	..	37	57
5	22	15.4	..	..	37	62	5	51	0	13	20	..	..
5	24	0	12	20	18	30	5	51	37.6	28	43	28	43
5	25	51.7	..	..	35	58	5	51	49.0	..	..	43	66
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5	27	51.4	..	..	17	28	5	55	36.5	27	41	27	41
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5	33	31.7	..	..	21	34	6	5	17.6	..	..	23	34
5	34	17.1	13	21	26	42	6	5	48.3	21	31	42	62
5	35	10.8	18	29	36	58	6	6	6.1	..	..	40	59

*Previous tables in this series were published in December, 1930, and January and April, 1931, MACHINERY.

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Angle in Degrees, Minutes, and Seconds			B. & S., Becker, K. & T., Hendey, and Rockford		Cincinnati and LeBlond		Angle in Degrees, Minutes, and Seconds			B. & S., Becker, K. & T., Hendey, and Rockford		Cincinnati and LeBlond	
Deg.	Min.	Sec.	No. of Holes	Circle	No. of Holes	Circle	Deg.	Min.	Sec.	No. of Holes	Circle	No. of Holes	Circle
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6	8	10.9	..	..	45	66	6	37	21.5	..	..	39	53
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6	12	24.8	20	29	40	58	6	40	38.7	23	31	46	62
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6	19	27.5	26	37	26	37	6	49	5.4	25	33	50	66
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6	21	10.5	12	17	36	51	6	49	39.3	22	29	44	58
6	21	43.4	..	..	41	58	6	50	0	..	..	41	54
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6	22	30.0	..	..	17	24	6	50	52.1	..	..	35	46
6	23	13.5	22	31	44	62	6	51	25.7	16	21	32	42
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6	24	24.4	..	..	42	59	6	52	6.3	..	..	29	38
6	24	32.7	..	..	47	66	6	52	56.4	13	17	39	51
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6	28	48.0	..	..	18	25	6	57	16.3	..	..	51	66
6	29	18.1	31	43	31	43	6	57	44.1	..	..	41	53
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6	31	45.8	..	..	37	51	7	0	0	14	18	42	54
6	31	56.1	..	..	45	62	7	1	1.0	..	..	46	59
6	32	43.6	24	33	48	66	7	1	27.8	32	41	32	41
6	33	33.5	..	..	43	59	7	2	36.5	18	23	36	46
6	34	3.2	27	37	27	37	7	3	14.5	29	37	29	37

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portant changes have been made since the electrode was announced in the May, 1930, number of MACHINERY, page 745.

The coating of this electrode contains no carbon, a feature that serves to eliminate porosity. Greater ductility and tensile strength are among the advantages claimed.

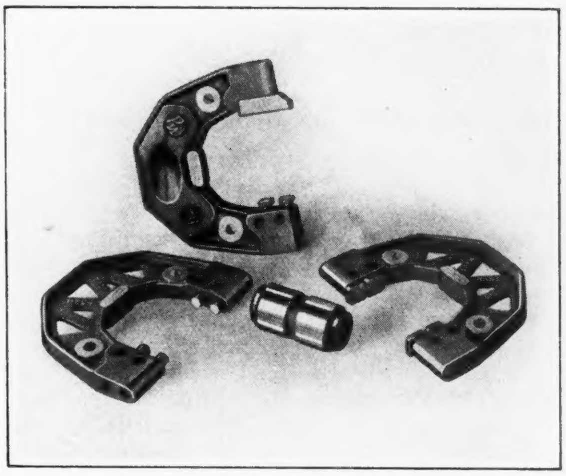
Pratt & Whitney Limit Gages and Setting Plugs

The three styles of adjustable-limit snap gages, with Trusform frames, and the setting plug here illustrated, are recent products of the Pratt & Whitney Co., Hartford, Conn. The Model C gage shown at the top of the illustration is made with one solid anvil and two adjustable anvils. The frame is equipped with a Bakelite grip on each side to insulate it from the heat of the hand and to facilitate handling. Sensitive screw adjustment is provided for setting the anvils with size blocks or plug gages. Two beveled bushings which bear on two flat surfaces on the anvil shank prevent the setting from being disturbed when the locking screw is tightened.

The Model B gage shown at the right differs from the Model C in that it has four square, adjustable anvils. These anvils are so placed that the gap between them is too small to allow work to drop between the adjacent sides. The Model A gage shown at the left has adjustable round anvils. These anvils have small contact surfaces, which give the more sensitive "feel" required for some types of gaging.

The Model C gage is made in fifteen frame sizes which provide a complete gaging range of from 0 to 12 inches. The Model B gage is provided in eight sizes covering a range of from 1/8 to 5 inches, while the Model A is available in eight sizes providing a range of from 0 to 5 inches.

The "Go" and "Not Go" setting plug gage shown in the center of the illustration is now made in any size required for setting snap gages to previously fixed dimensions. These gages are ground and machine-lapped to size and have heat insulators at each end. The insulators are red on the "Not Go" end and green on the "Go" end.



Three Styles of Limit Snap Gages and a Setting Plug Gage Made by the Pratt & Whitney Co.

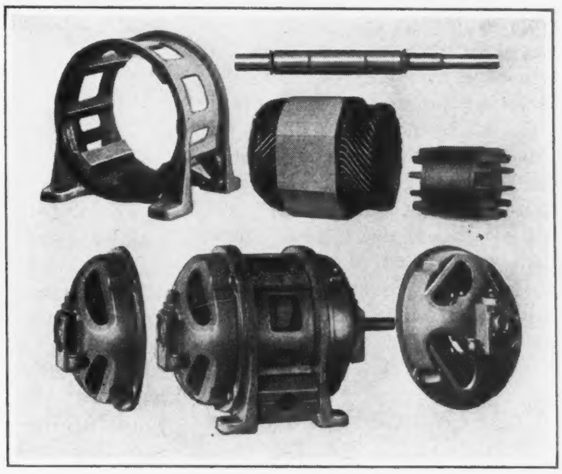
Grant Small-sized Riveting Hammer

Rivets from 3/32 to 3/16 inch in diameter can be headed cold in a No. 2A "Vibratory" hammer recently added to the line of riveting machines built by the Grant Mfg. & Machine Co., N. W. Station, Bridgeport, Conn. Except for size, this machine is of the same construction as the No. 3A described on page 644 of April MACHINERY. The hammer spindle vibrates vertically 1500 blows per minute for 3/32-inch rivets, 1900 blows for 1/8-inch rivets, and 2400 for 3/16-inch rivets. The machine requires a 1/2-horsepower motor running at 1750 revolutions per minute.

Westinghouse Motor with Standardized Parts

In the W-frame Type CS squirrel-cage induction motor recently brought out by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., all the mechanical and electrical parts are entirely separate units. This permits a motor for a specific application to be built up on short notice from the standardized units or parts kept in stock. Maintenance is also simplified and made less expensive, as any damaged electrical parts can be readily replaced. Thus it is unnecessary to rewind a damaged motor or replace it while repairs are being made.

The accompanying illustration shows an assembled motor and also the separate units from which it is constructed. Many motor styles are available, such as vertical, horizontal, open, semi- or totally-enclosed, and motors without feet for mounting flush against machines.

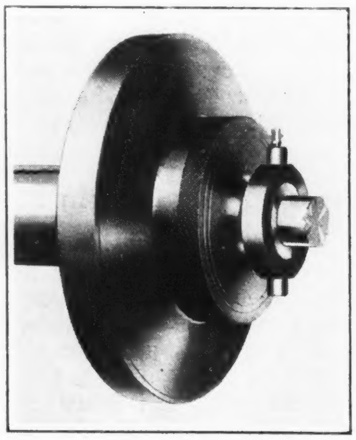


Westinghouse Motor and Standardized Parts from which it is Constructed

Diamond "D" Friction Clutch

The safety disk friction clutch shown in the illustration has been developed by the Dodge Mfg. Corporation, Mishawaka, Ind., for machinery applications, as well as power transmission service. This Diamond "D" clutch is compact, although all parts have been made large enough to keep their strength well within the limits required to transmit the rated horsepower. The friction disks are asbestos and have ground faces.

The clutch is fully enclosed in both the engaged and disengaged positions. This insures safety and full protection against dust and dirt. The heavy-duty slip ring by which the clutch is engaged or disengaged is easy to lubricate and can be furnished in either bronze or ball-bearing types. The movement of the slip ring is not affected by wear of the friction material or adjustment of the clutch. A self-locking toggle mechanism allows easy and positive engagement and disengagement. The clutch is provided with a one-point adjustment.



Dodge Safety Disk Clutch Shown in the Engaged Position

Wells Grinder for Power Hacksaw Blades

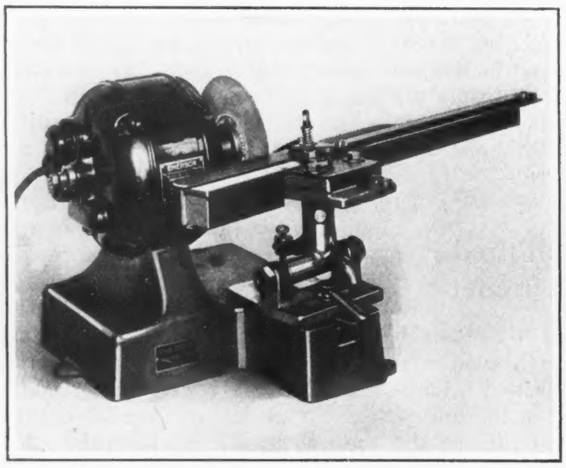
The grinder shown in the accompanying illustration has been developed by the Wells Mfg. Co., Greenfield, Mass., for sharpening the teeth of power hacksaw blades. The teeth are ground by rocking the blades alternately toward and away from the grinding wheel. The machine is semi-automatic and is rapid in operation, as each motion of the rocking arm moves the blade into position for a new cut. The machine is especially adapted for grinding high-speed blades, and will sharpen blades of any width or length, having any number of teeth per inch within the range of from four to fourteen, inclusive.

Adjustments can be made for sharpening alternate teeth at opposite angles to give the saw a free cutting action. The machine is equipped with a 1/4-horsepower motor, two grinding wheels—one for coarse- and the other for fine-tooth saws—and a diamond for truing the grinding wheel.

Multiple Magazine Feed for Hall Planetary Milling Machine

To facilitate feeding ring-shaped parts into position for milling in "Hall Planetary" milling machines, a new multiple magazine feeding device has recently been developed by the Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia, Pa. The machine for which this feed was designed was described on page 15, of September, 1927, MACHINERY. The magazines are made in several sizes, the largest of which is capable of feeding four parts simultaneously. They may be adapted for internal or external "planamilling" and "planathreading" of work which can be chucked by any type of collet gripping the work internally or externally.

In Fig. 1 is illustrated a magazine for feeding two ball-bearing races into position for cutting annular grooves. Gaging points at the upper end of each chute prevent over-size races from passing through the magazine. The action of the transfer mechanism is clearly shown in



Wells Semi-automatic Grinder for Sharpening Power Hacksaw Blades

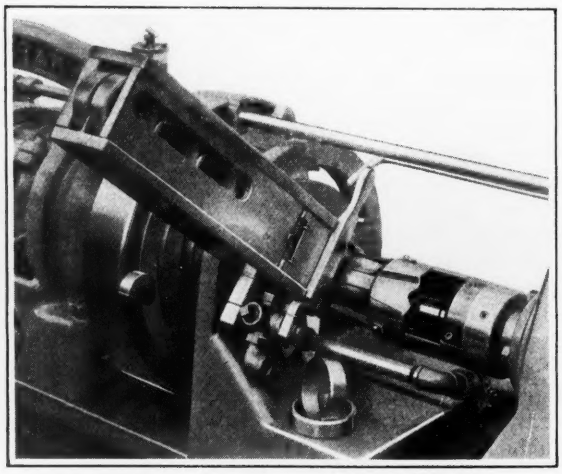


Fig. 1. Multiple Magazine Feed for Hall Planetary Milling Machine

Fig. 2. Here the two races *E* are shown after they have just been grooved by the gang cutters *C*. During the grooving operation, the races are gripped in the spring collet *A*, the gripping action being obtained by the pressure of the tapered portion of the collet against the stationary ring *B*. This pressure is imparted to the collet by a pneumatic or oil cylinder at the right-hand end of the machine. The piston, which is indicated at *F*, is connected to the collet. The bracket in which ring *B* is mounted also serves as a stop for locating the races in the correct position relative to the grooving cutters.

When the grooves have been completed, the cutters are moved to the position shown through the planetary action of the machine, and an automatic tripping device in the machine head opens a valve which controls the air or oil entering the cylinder and causes the collet and the grooved races to move toward the right. The two races *D*, however, which have previously dropped into the collet, are held stationary by a stop *G*. Consequently, as the collet continues to move toward the right, the grooved races are ejected when they come in contact with the races *D*. At this point, the tripping device again manipulates the air or oil valve and causes the collet to return, with the races *D*, to its former position. At this time, two more races drop from the magazine into the collet.

A spring-actuated valve in the air or oil line leading to the cylinder prevents the machine from being damaged by the rings jamming as they enter the collet. When this valve is closed, the pressure against the piston is released and further movement of the collet is prevented. The valve is operated by a latch attached to a small door at one side of the magazine. If the rings should jam, this door will be forced outward, releasing the spring and closing the valve. As an added precaution, the stop *G* is so designed that excessive pressure of the rings against its face will cause the shaft *H*, attached to the stop, to move endwise and close the valve. To further prevent any chance of damage from jamming, an electric switch is provided for shutting down the motor when the magazine door opens; the switch also shuts down the motor if the shaft *H* is forced to the right by the jammed races.

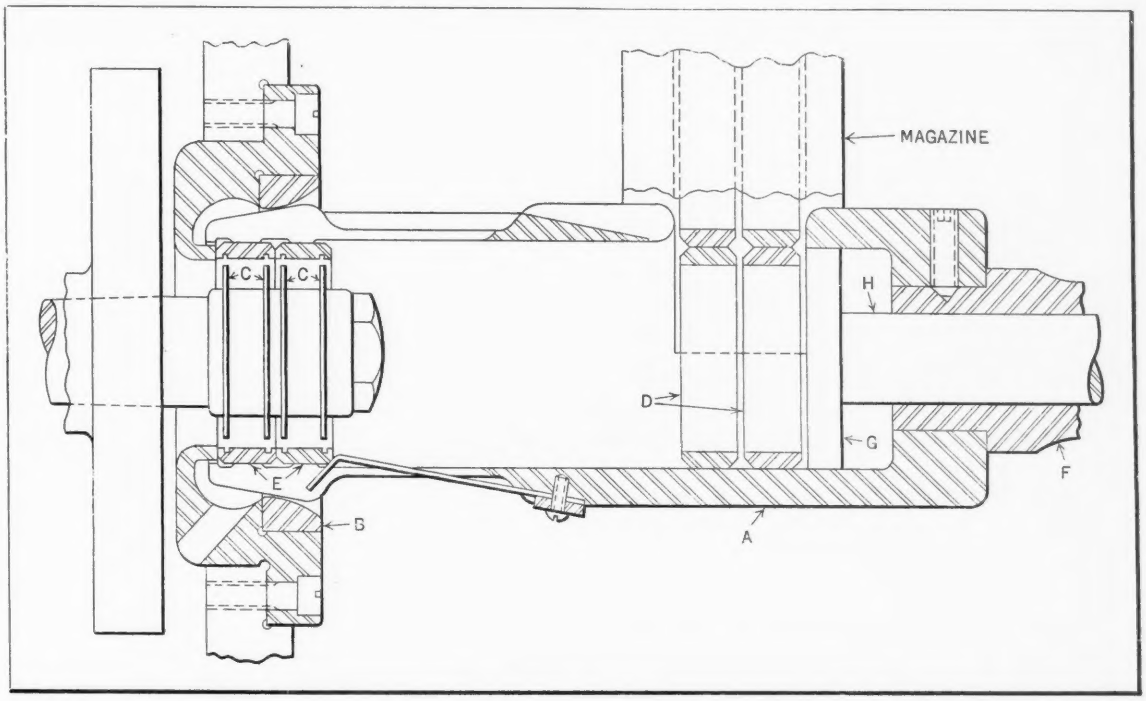


Fig. 2. Transfer Mechanism on Magazine Attachment Shown in Fig. 1

Kellocator Jig Boring Machine

A machine designed for precision jig boring and lay-out work is being placed on the market by the Keller Mechanical Engineering Corporation, 74 Washington St., Brooklyn, N. Y. The only measuring device used on this machine is the vernier scale. One scale is provided for measuring the longitudinal movement of the table, and another for measuring the transverse movement. These scales enable the operator to determine the exact position of the work at a glance.

Settings can easily be made without moving the work or the table by lining up a graduation on the scale with another graduation on the vernier. Reading is

done, as shown in Fig. 2, through a 10-power flat-field magnifying glass equipped with a built-in electric light. This magnifying glass is designed to eliminate any possibility of visual distortion. An adjusting screw is provided for lining up the scale and vernier to the nearest even inch. Thus the operator need not add or subtract decimals or fractions in determining successive locations, but can read the decimal directly from the blueprint and set the vernier accordingly.

An unusual feature is an electrical stop by which location becomes automatic. The snapping off of a toggle switch causes the machine table to move at a uniform speed through a magnetic-clutch driven lead-screw. As a contact fastened to the table touches the anvil of the vernier slider, the magnetic clutch releases the lead-screw and the table stops in the predetermined position within an accuracy of 0.0002 inch.

A new locking device, which is designed to prevent slippage of the table over an oil film, has been incorporated in the machine. By using the automatic reversible spindle feed, the operator need not wait until one hole is finished before making a setting for the next hole.

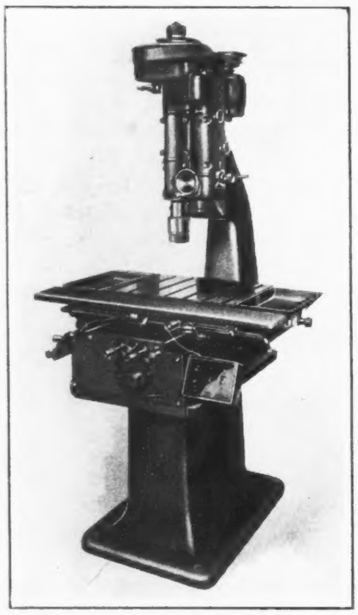


Fig. 1. Jig Boring Machine Built by the Keller Mechanical Engineering Corporation

The machine is so designed that its precision is entirely independent of any wear on the lead-screw or other moving parts. A new quick-change collet enables the tools to be changed quickly. Eight spindle speeds are obtainable, ranging from 77 to 1750 revolutions per minute. There are two reversible automatic feeds of 0.002 inch and 0.005 inch. There is also a choice of handwheel and hand-lever feeds. The over-arm is furnished with a crank providing a vertical adjustment of 6 inches. The horizontal and transverse table movements are 18 and 12 inches, respectively, and the table has a working surface of 14 by 21 inches. The distance

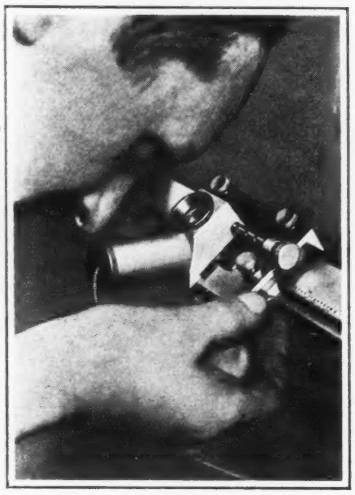
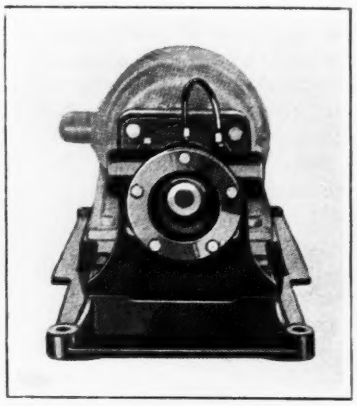


Fig. 2. Reading the Vernier Scale Setting on Machine Shown in Fig. 1

from the table top to the spindle end ranges from 2 1/2 to 14 1/2 inches. The machine weighs 1375 pounds.

Viking Rotary Hydraulic Pumps

Rotary pumps designed for the hydraulic operation of multiple-spindle drilling machines, tapping machines, broaching equipment, and other machine tools are being introduced on the market by the Viking Pump Co. of Delaware, Cedar Falls, Iowa. These pumps are manufactured in six models, with capacities



Viking Rotary Pump for the Hydraulic Operation of Machine Tools

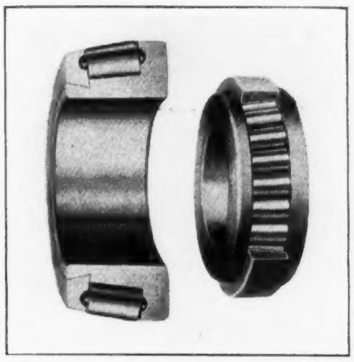
ranging from 5 to 45 gallons per minute at 1200 revolutions per minute. They are suitable for developing pressures up to 500 pounds per square inch.

With the exception of the 5-gallon unit, the pumps have identical flanges and hubs. Thus they are interchangeable and can be mounted on identical brackets. As shown in the illustration, the pumps are designed with opposite ports, which eliminates the necessity of specifying "right-hand" or "left-hand." This is possible because the pumps are reversible in operation and the direction of flow depends upon the direction in which the power drive shaft revolves. The driving shaft is mounted in roller bearings.

The pump can be furnished separately or in the form of a self-contained motor-driven unit, as shown in the illustration. It is said that a mechanical efficiency of from 50 to 80 per cent, depending upon the pump size, is obtainable at a pressure of 200 pounds per square inch.

Tyson Cageless Tapered Roller Bearing

A line of cageless tapered roller bearings designed as shown in the accompanying illustration is being produced by the Tyson Roller Bearing Corporation, Massillon, Ohio. These bearings are made in all S. A. E. sizes and are interchangeable with other types of anti-friction



Section Views of Tyson Cageless Roller Bearing

bearings. The absence of a cage or retaining ring is the principal feature, positive roll alignment being obtained by the use of a double-ribbed back plate at the big end of the rolls. The shoulder of each roll has a bearing on the inside rib of the back plate, as in conventional tapered roller bearings, but it also has an additional bearing on the outside rib. Positive alignment, both longitudinally and vertically, is claimed for this construction. Pintles at both ends of the rolls, extending into annular grooves in the back plate and closing ring, hold the rolls in place when the cup is removed.

By eliminating the cage, from 20 to 50 per cent more rolls can be used. It is claimed that the high speed and load-carrying capacities of these tapered roller bearings make them particularly adapted for use in the machine tool industry and other industries having the same or similar requirements.

Mikrotast Snap Gage for Revolving Work

The Krupp Mikrotast snap gage here illustrated is being placed on the American market by the Coats Machine Tool Co., Inc., 110-112 W. 40th St., New York City. This gage is applicable to rotating as well as stationary work. All contact points are faced with Widia tungsten carbide in order to resist the abrasive action of rotating work. There are two round contact pads of this metal on the lower anvil, back stop and measuring contact lever.

The gage is made in five capacities, the anvil and the back stop of the smallest gage being adjustable to accommodate work from 0.787 to 1.378 inches in diameter, while the largest size can be adjusted to accommodate work from 3.543 to 4.724 inches in diameter. Standard Mikrotast indicators will fit these gages.

The illustration shows the red tolerance markers provided to indicate the plus and minus limits. These markers can be set by simply rotating two knurled nuts on the back of the housing. A movement of the pointer to the left indicates a

Mikrotast Snap Gage with Widia Contact Points

plus measurement, and a movement to the right indicates a minus measurement.

Ruthman Pump for Grinder Compound

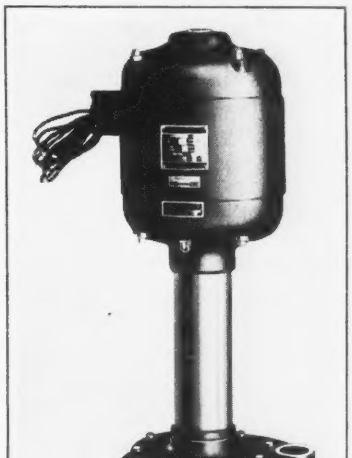
A vertical, ball-bearing, motor-driven pump designed for circulating grinding compound has just been brought out by the Ruthman Machinery Co., 530 E. Front St., Cincinnati, Ohio. This pump has a capacity for delivering 120 gallons of compound per minute. The two-horsepower motor is direct-connected to the pump and runs at a speed of 1725 revolutions per minute.

The pumping action is performed by an impeller, so constructed as to prevent clogging by the abrasive material, chips, or grit contained in the coolant water or grinding compound. An intake strainer is provided, however, to eliminate all possibility of injury to the impeller. This strainer has openings large enough to allow the liquid to pass freely, but small enough to prevent large particles of waste, rags, or abrasive material from entering the pump intake.

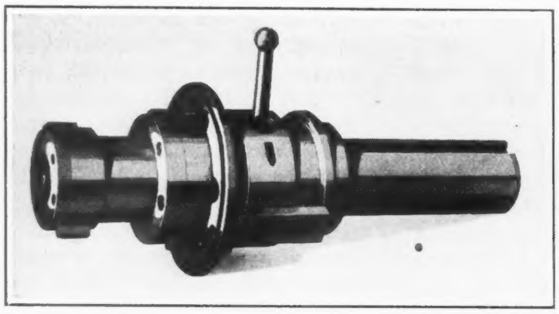
The upper end bell, or motor bearing flange, is enclosed, so that all foreign matter or dirt is prevented from entering the motor. The pump can be furnished for both immersed and outside installation, and is also obtainable in several sizes ranging from 1/4 to 5 horsepower.

Geometric Combination Collapsing Tap

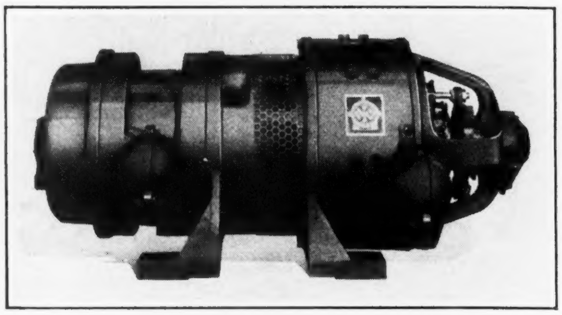
A special combination collapsing tap for cutting two threads of different diameters at one time has been developed recently by the Geometric Tool Co., New Haven, Conn. This tool is known as a 3- and 4-inch Class "S D" tap. It is equipped to cut twelve U. S. form threads per inch, 3 11/16 and 4 5/8 inches in diameter, at the same time. Two sets of chasers engage the work



Ruthman Pump which Delivers 120 Gallons of Grinding Compound per Minute



Geometric Collapsing Tap for Cutting Threads of Different Diameters Simultaneously



Reliance Motor-Generator Set of a Design Requiring Two Bearings Only

simultaneously or at such points that they finish their respective threading operations at the same time.

There are many possible uses for a tap of this kind, although, of course, the pitch of the two threads must be the same. Also, the two holes to be tapped must be far enough apart to permit the use of two sets of chaser slots and two complete plungers for holding the chasers in the tool, but the holes must not be so far apart that the tool will have excessive overhang.

The tool shown is regularly used in a stationary machine as a plate-trip, hand-reset type, but it has also been used successfully on a chucking machine as a rotary-tap, plate-trip, automatic-reset type. The chasers have independent size adjustments. Both sets collapse at the same time, the collapsing action being brought about either through contact of the trip plate with the face of the work or through the use of a fork operating in the groove of the closing sleeve. This combination tap can be used for straight-hole tapping or for cutting taper threads such as are required in pipe fittings.

Reliance One-unit Motor-Generator Set

The one-unit, motor-generator set here illustrated has been developed by the Reliance Electric & Engineering Co., 1088 Ivanhoe Road, Cleveland, Ohio. An alternating-current motor and direct-current generator are combined in a single unit requiring only two bearings, one at each end of the unit. This outfit can be furnished for operation on either two- or three-phase circuits of any standard voltage or frequency, and have an output ranging from 1 to 5 kilowatts at 125 or 250 volts. Either sleeve bearings or ball bearings may be provided.

"Standard" External Gage and Bore Comparator

Rapid operation combined with high precision is the outstanding feature of a line of external and internal gages recently brought out by the Standard Gage Co., Inc., Poughkeepsie, N. Y. The external gage shown in Fig. 1 is graduated to 0.0001 inch. Wide-spaced divisions and figures on the dial permit rapid reading and these divisions can easily be subdivided by the eye to obtain readings of greater accuracy. An unskilled operator can check over 3600 pieces an hour. The measuring point of the dial has a vertical movement of 0.015 inch.

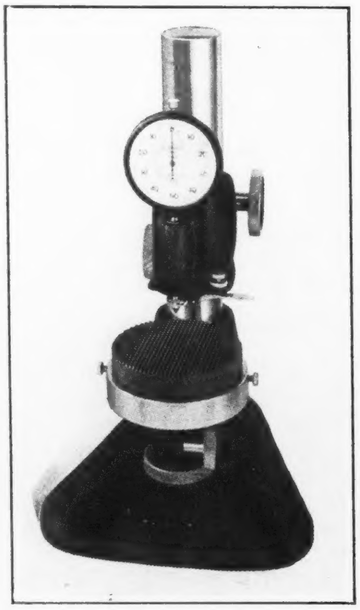


Fig. 1. "Standard Gage" External Comparator with Serrated Table

Inaccurate readings resulting from slight particles of dirt under the work, as well as from microscopic irregularities on the work surface, are reduced to a minimum by employing a table with a serrated surface. These serrations also prevent flat masters or work from clinging to the table. The table is 4 inches in diameter, hardened, seasoned, ground, and lapped. For parts having obstructing shoulders, special tables are provided. The tables can be rotated in the holder to different positions, so that narrow pieces being checked will not rest in the serrations.

To set the device for checking parts of various shapes up to 6 inches in diameter or thickness, the dial head is raised or lowered on the column; and for final adjustment, the table is moved vertically.

For greater accuracy, the circular dial can be replaced by the dial shown in Fig. 2. This dial is graduated to 0.00005 inch, and has a vertical movement of 0.002 inch. Both dials have diamond gaging points.

In Fig. 3 is shown an internal gage used for checking holes for bell-mouths, tapers, out-of-roundness, or any departure from a straight bore. Because

of its rapid operation and accuracy, it is especially adapted for checking ball-race bores, bushings, etc. The divisions recorded on the dial are graduated to 0.0001 inch, and they are spaced sufficiently wide to enable one-quarter of a division to be readily estimated by the eye when greater accuracy is specified.

The work is slipped over two arms projecting from the body of the device. Tungsten-carbide knife-edges—one inserted under the lower arm and one in each side of the upper arm—provide long-life bearing points for the work bore. The lower arm is stationary, but can be adjusted up or down to accommodate various bores. The upper arm is spring-actuated and has a short vertical movement, so that when the work is slipped into place, all three knife-edges come in contact with the bore and hold the piece snugly in accurate alignment.

Linked to the dial gage and nested in the upper arm is the indicating lever, on the outer end of which is mounted a diamond gaging point. As the work is slipped over the arms, this diamond point sweeps along the entire length of the bore, registering any irregularities on the dial. An interchangeable collar which rests against the sloped surface of the device serves as a stop to prevent the work being gaged from passing beyond the diamond point.

For long bores, the part is reversed on the arms, each half

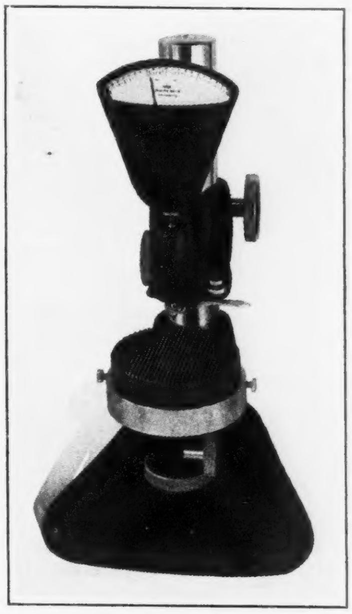


Fig. 2. Indicator Graduated to 0.00005 Inch Applied when Greater Accuracy is Required

of the bore being checked separately. Several sizes of these comparators are available for work having bores ranging from 1/2 to 3 inches in diameter and up to 3 inches in length.

De Vilbiss Motor-driven Spray-Painting Outfit

A motor-driven spray-painting outfit, designed for operation by one man, has recently been placed on the market by the De Vilbiss Co., Toledo, Ohio. This outfit is of light construction and can readily be transported from place to place.

The complete equipment consists of a 1/2-horsepower motor-driven compressing outfit, a caster base, a pressure-feed spray gun, and a two-gallon pressure-feed paint tank.

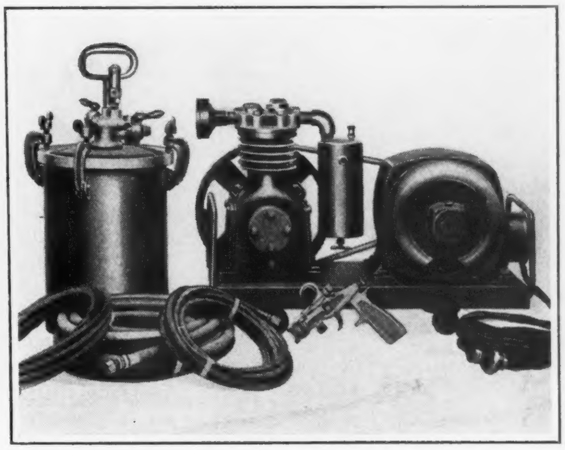
"Kellerflex" Mica Under-cutter

A mica under-cutter has been brought out by the Keller Mechanical Engineering Corporation, 74 Washington St., Brooklyn, N. Y., to provide a more accurate and faster method of under-cutting the mica insulation between the commutator segments of industrial motors. This under-cutter can be attached to flexible shaft drives of either the bench or floor stand type.

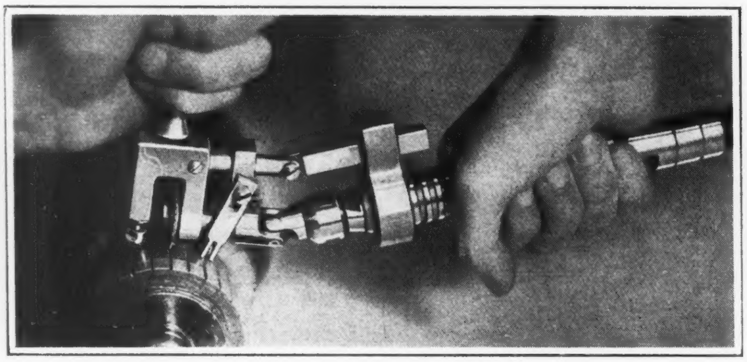
The "Kellerflex" drive recommended for use with the under-cutter has a ball-bearing motor of 1/4 horsepower which operates at a speed of 1750 revolutions per minute on alternating or direct current of either 110 or 220 volts.

Either 1- or 1 1/8-inch V- or U-type cutters are employed. The cutter-spindle runs in oilless bearings. The driving shaft is chucked in a collet having a universal joint which permits the under-cutter to be used on commutators of railway and industrial motors without dismantling them. The depth gage, saw, and guide rollers can be adjusted for

Fig. 3. "Standard Gage" Comparator for Checking Bores



De Vilbiss Spray-painting Equipment with Motor Drive



"Kellerflex" Motor-driven Tool for Under-cutting Mica between Commutator Segments

work on commutators from 4 to 24 inches in diameter, and for cutting the mica to any desired depth. The grooves produced by this tool are smooth at the bottom and of uniform depth. Also, there is no breaking of the mica at the end of the commutator bars.

The handle of this under-cutter can be inserted either in the top or in the side of the attachment to suit the available working space.

"Philweld" Gears

The Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa., have introduced on the market a line of welded steel gears, ranging in diameter from 15 to 168 inches, which are especially adapted for heavy-duty service. While similar in appearance to cast-steel gears, they give 30 to 50 per cent longer life and have approximately 50 per cent greater tensile strength. They are made from S.A.E. 1040 steel plate throughout.

The rim is cut in the form of a solid ring from a flat plate by means of a gas torch. A solid rolled-steel disk forms the web of the gear, and on both sides of this web, pressed-steel arms of channel shape are welded. The hub is a forged steel bar drilled to receive the shaft. After being welded together, the finished structure is normalized to prevent warping.

Spur, helical, herringbone, bevel, internal, and continuous-herringbone (Sykes type) gears are available in the welded steel construction, as well as in cast steel. The welded gears weigh about 10 per cent less than cast-steel gears. The heavy-duty speed reducer units made by the company, which have been provided with cast-steel gears, may now be supplied with "Philweld" gears if desired. These gears are being placed on the market after having been thoroughly tested under severe service conditions.

Advantages claimed for gears of the welded type include better proportioning, as no consideration need be given to the restrictions of molds. Also, there are no blow-holes to cause failure or internal casting strains to threaten a breakdown. Longer wearing life is also mentioned as a feature. The gears are naturally balanced, because their metal is of uniform density throughout.

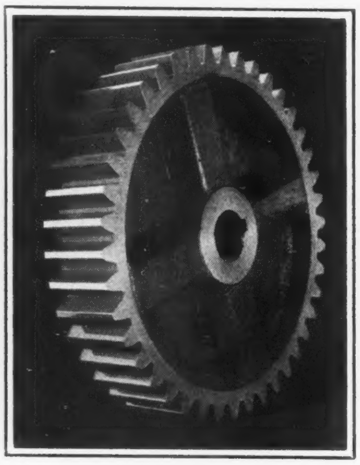


Fig. 1. "Philweld" Welded-steel Spur Gear

Ekstrom-Carlson Eight-station Automatic

The automatic eight-station machine here illustrated has recently been developed by Ekstrom, Carlson & Co., 1439 Railroad Ave., Rockford, Ill. This machine was primarily designed for drilling and reaming a tapered hole, 9/16 inch in diameter at the large end and 5/16 inch in diameter at the small end, to a depth of 2 1/8 inches in steel forgings, and for facing the end of the forging shank and taper-turning an outside diameter for a length of 1 inch. Cuts are taken at seven stations, the eighth station being employed for reloading.

Each station is provided with self-centering work-holding jaws. The operator loads and unloads work by the use of a double-handle key wrench. This wrench is automatically disengaged from contact with the jaw screw before indexing takes place, and is automatically brought into contact with the screw again upon the completion of the indexing. Cams timed in unison with the spindle feed perform the indexing automatically. Five operating speeds providing 2, 2 1/2, 3, 3 1/2, and 4 cycles per minute are available through change-gears accessible at the front of the machine.

Power is transmitted from a 7 1/2-horsepower motor to the spindle gear-box through a silent chain. The drill spindles run at

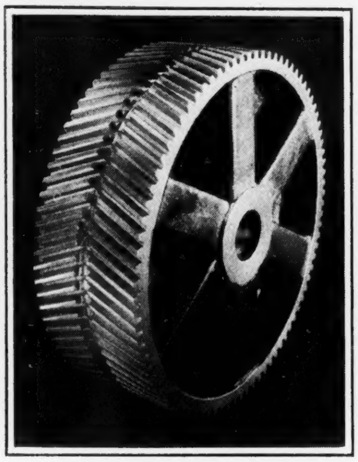
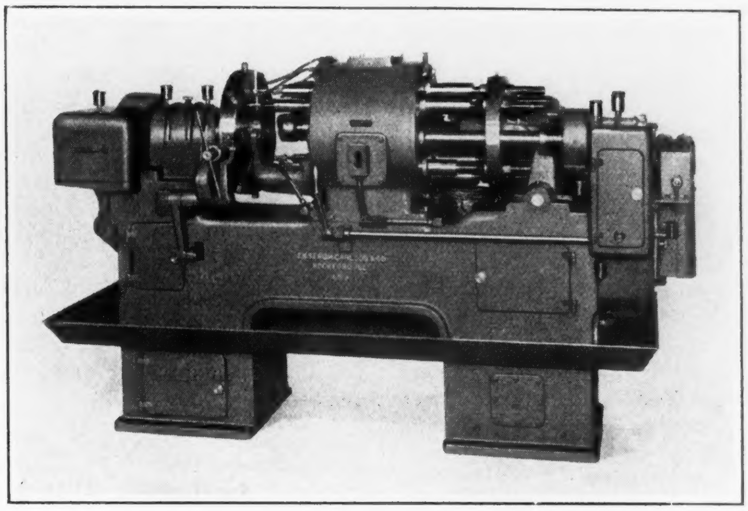


Fig. 2. Welded-steel Herringbone Gear

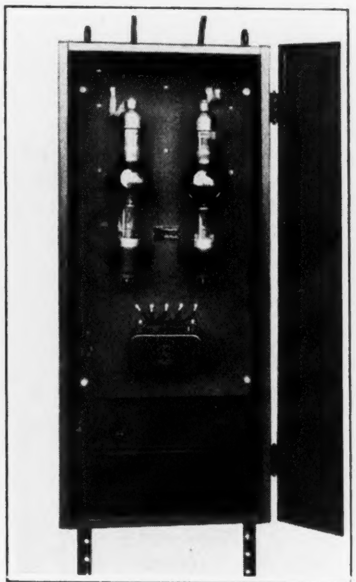


Ekstrom-Carlson Eight-station Automatic Boring, Turning, Facing, and Reaming Machine

740 revolutions per minute, and the reaming and turning spindles at 305 revolutions per minute. All the spindles can be readily set for the desired depth of cut. A coolant pump delivers 24 gallons of compound per minute. A force-feed system of lubrication is furnished.

Control for Spot and Intermittent Line Welding

Intermittent line and spot welding with interruptions as frequent as 1000 per minute, and even higher, are possible with a new type of control equipment announced by the General Electric Co., Schenectady, N. Y. This control uses "thyratron" tubes instead of contactors for interrupting the flow of current. A switch operated by a cam that is driven by a variable-speed motor determines the number of welds per minute through control of the voltage imposed on the grids of the "thyratron" tubes. As shown in the accompanying illustration, the only parts mounted on the front of the panel are the two "thyratron" tubes and the time-delay relay. The entire panel is enclosed in a sheet-metal case provided with a door that can be locked.



Control Panel for Spot and Intermittent Line Welding

Reed Ball-bearing Drilling Machines

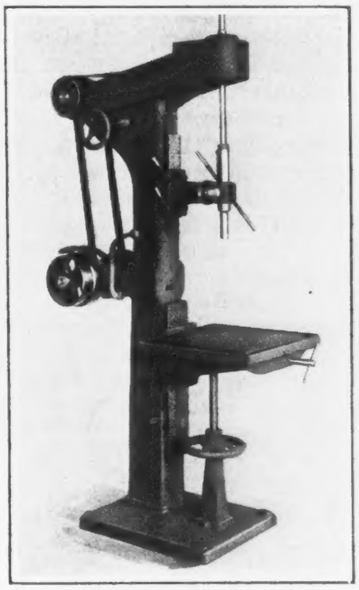
Two types of ball-bearing drilling machines with capacities for production service, using drills up to 3/4 inch in diameter, have been placed on the market by the Francis Reed Co., 41-43 Hammond St., Worcester, Mass. A balanced belt tightener, belt enclosure, long belt contacts, and simple construction are the features of these machines.

The Type S machine shown in the illustration has a plain bearing spindle with a ball thrust bearing, while the Type SB machine has a full ball-bearing spindle. The latter machine also has three power feeds of 0.004, 0.008, and 0.012 inch. Both types of machines are made with from one to six spindles.

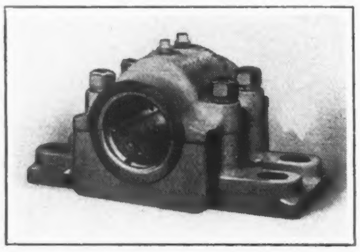
Robins-Jones Bearing

The bearing here illustrated, which is intended for heavy-duty machinery, is being placed on the market by the Robins Conveying Belt Co., 15 Park Row, New York City. It was designed by John David Jones and will be known as the Robins-Jones bearing. This bearing is suitable for shafts running at both low and high speeds within a range of from 1 to 5000 revolutions per minute.

The base of this bearing has an ample oil reservoir from which oil is drawn up by the rotation of the shaft through a series of ducts or passageways in the bearing metal to the point on the bearing that is subjected to the greatest pressure. From this point, the oil is spread uniformly over the whole shaft. At the parting of the cap and base, there are slots from which holes return the excess oil to the reservoir. Grooves near each end of the bearing prevent leakage and return oil that works out at the ends of the bearing to the reservoir.



Reed Drilling Machine Made in One- to Six-spindle Styles

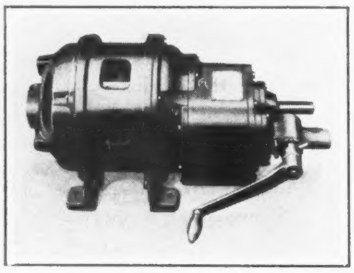


Robins-Jones Bearing Made by the Robins Conveying Belt Co.

As the bearing cap is provided with an oil reservoir similar to the one in the base, the bearing can take a load or pressure from any direction. It may be applied to vertical as well as horizontal shafts, and can also be used where continual reversal of the shaft is necessary.

Westinghouse-Wise Multi-speed Drive and Motor

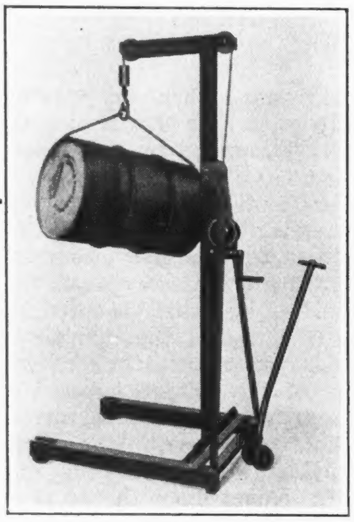
A multi-speed reduction gear unit combined with a standard alternating-current motor, as shown in the illustration, is being placed on the market by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This unit is known as the Westinghouse-Wise multi-speed drive, and is a development of Ray T. Wise, consulting engineer of the company. The drive is constructed to give four different speeds to the driving shaft at a constant horsepower output. All gears are constantly in mesh, and speeds can be changed instantly while the motor is running at full speed and under load without danger of damaging the unit. This drive is made in three sizes, ranging from 1/2 to 7 1/2 horsepower.



Westinghouse-Wise Multi-speed Drive

Lewis-Shepard Portable Cranes

Four types of portable cranes have been added to the line of material-handling equipment manufactured by the Lewis-Shepard Co., Watertown Station, Boston, Mass. The type illustrated has both the boom and the main upright hinged, so that they can be folded down to permit the crane to pass through practically any doorway. A telescopic type can be made to suit any ceiling height and yet be taken through an ordinary door. A revolving hinged type, which will swing through an arc of 360 degrees, and a revolving telescopic type complete this new line of cranes. All four types can be furnished with a hand worm-drive winch, a hand spur-gear drive winch, and an electric drive winch. Air-motor and gasoline-engine equipment can also be used for operating the cranes. The standard capacity is 2000 pounds, but cranes of greater capacities can also be furnished.



Lewis-Shepard Hinged-type Portable Crane

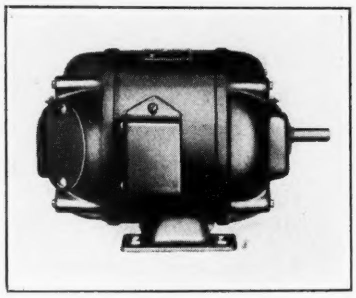
Century Fractional-Horsepower Motors

A line of fractional-horsepower motors in alternating- and direct-current types, all of which have the same mounting dimensions, has been brought out by the Century Electric Co., 1806 Pine St., St. Louis, Mo. The bearing brackets of these motors are designed to protect the motor against falling objects, dirt, or dripping water. These motors, which are illustrated below, have rolled-steel frames and welded-steel feet with slots that permit belt adjustment. The bearings are machined from phosphor-bronze castings, and are lubricated by the wool yarn system.

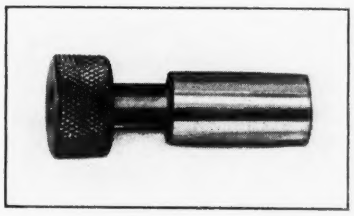
Van Keuren Utility Plug Gage

The plug gage here illustrated has been developed by the Van Keuren Co., 12 Copeland St., Watertown, Mass., for use in gaging the finished size of a hole, as well as for measuring the hole while it is being brought to size by lapping, grinding, or boring. The gage has a tapered and a straight section, and is provided with a short knurled grip that permits it to be inserted in the work without moving the cutter or grinding tool any great distance.

The end of the gage has a taper of 0.010 inch in 1/2 inch of length. This tapered portion is ground on the entering end of the plug, while the remaining portion is precision-lapped to the size desired for gaging the finished hole. For measuring the hole while finishing it to size, the workman simply inserts the tapered end and notes the distance that the plug enters. This shows him how much material must be removed to bring the hole to the finished size. If the plug just



Century Fractional-horse-power Motor



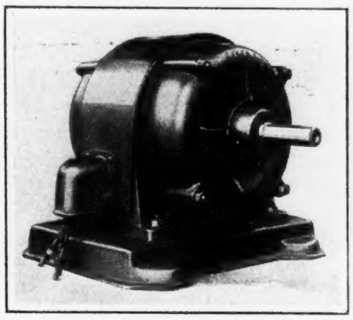
Gage that Shows Stock to be Removed and Checks Finished Holes

enters, it is still necessary to remove 0.010 inch, while if it enters to a point half way up the taper, 0.005 inch must be removed to bring the hole to size. Thus, for example, each 1/20 inch on the taper corresponds to an increase of 0.001 inch in the diameter.

Drip-proof Unit-type Motor

A motor that is protected from water or other liquids that might drip on it or be splashed in through the ends has been added to the line of unit-type motors made by the Ideal Electric & Mfg. Co., Mansfield, Ohio. Water entering the motor is immediately discharged through a vent at the bottom of the enclosing jacket without coming in contact with the windings. As an additional precaution, the insulation of the windings is so prepared that an occasional wetting, through unforeseen causes, will have no serious effect.

Air for cooling purposes is circulated from both ends of the motor toward the center, where it passes out through the vent at the bottom.

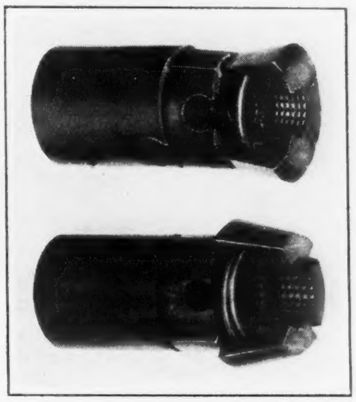


Drip-proof Motor Made by Ideal Electric & Mfg. Co.

Equalizing Collets for Hot-rolled Steel

Collets having four compensating jaws designed as shown in the accompanying illustration have been developed by the Highland Park Tool Co., 3801 Trenton Ave., Detroit, Mich., to permit hot-rolled steel to be chucked in automatic screw machines with the same facility as finished bars.

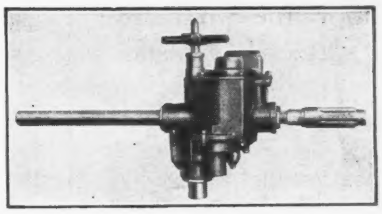
The compensating feature is designed to give the jaws a full grip on hot-rolled stock that is out of round within the limits of steel mill tolerances. Less power is required for chucking, as a result of the large gripping surface provided. This feature also lessens the strain on the collet parts, which are all accurately ground and interchangeable. The back portion of the collet need not be removed from the collet tube when changing jaws for holding work of different sizes.



Equalizing Collets for Chucking Hot-rolled Steel in Screw Machines

Chicago Pneumatic Rotary Drill

A No. 99-C pneumatic rotary drill adapted for general-purpose drilling and reaming, particularly in close quarters, has been placed on the market by the Chicago Pneumatic Tool Co., 6 E. 44th St., New York City. Although this drill has a capacity for drilling holes up to 1 1/2 inches and for reaming holes 1 1/8 inches in diameter, it weighs only 35 pounds, and has an over-all length of only 14 3/4 inches.

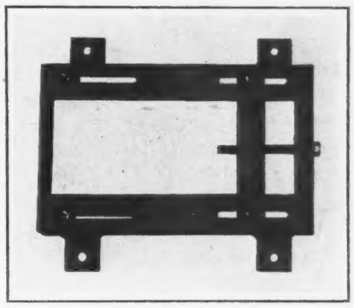


Rotary Drill of the "Power Vane" Type Made by the Chicago Pneumatic Tool Co.

This drill is equipped with ball and roller bearings throughout, and has a replaceable hardened steel cylinder liner. The light speed is 300 revolutions per minute. A governor air control is provided to prevent breakage of taps, drills, and reamer bits.

Lincoln Welded Motor Base

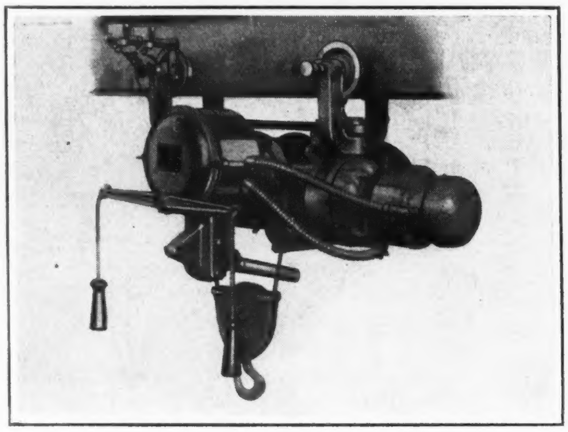
A welded-steel motor base of one-piece construction, now being placed on the market by the Lincoln Electric Co., Cleveland, Ohio, is shown in the accompanying illustration. This base is constructed of rolled-steel angles and flat bar stock welded together by the electric arc, and is intended for use instead of slide rails. The flanges of the angles to which the motor is bolted are slotted to permit moving the motor on the base for tightening the drive belt. A screw adjustment is provided at one end which makes it easy to move the motor on the base.



Lincoln Motor Base of Welded Steel Construction

Sprague Small-size Electric Hoists

Electric hoists of the construction illustrated are being placed on the market in 1/4- and 1/2-ton sizes by the Sprague Electric Hoist Division of the Shepard Niles Crane & Hoist Corporation, 380 Schuyler Ave., Montour Falls, N. Y. These hoists are equipped with a General Electric ball-bearing motor. Compactness, close head-room, and a simple worm drive are among the features. The wiring is entirely in conduit.



Sprague Electric Hoist Made in 1/4- and 1/2-ton Capacities

These hoists can be controlled either by a pendant rope, as shown, or by a push-button for fast-load handling. As the hoists are entirely enclosed, they are suitable for operation out of doors as well as indoors.

The trolley is of the swivel type, and is provided with ball-bearing wheels which permit short-radius turns to be made easily.

Planning Industrial Preparedness on a Practical Basis

By WALTER SODERHOLM, Captain, Ordnance Department, U. S. Army

With ordnance munitions almost entirely non-commercial in character and with government establishments capable of producing but a small part of the total requirements, the Ordnance Department faces a stupendous task in planning to procure over 90 per cent of its needs from industry in the event of war. Time is all important in war; early production is of primary importance, and, obviously, it must be secured from such existing machines and equipment as are suitable for the production of munitions.

Where are these machines? What is their capacity? Can the Department ascertain this without placing a burden of time-consuming detail and study on industry? It is the writer's belief that this can be done. A practical procedure has been worked out (placing the burden of the initial preparation of manufacturing data on the Department) which will enable the Ordnance District Offices to secure the following data, based on existing facilities: (1) The ordnance a factory is best equipped to produce; (2) a dependable estimate of capacity; (3) the time required before deliveries can start; (4) additional equipment required.

The writer has based his plan on the fact that the same basic methods and machines are used to manufacture all articles of like materials. Although ordnance munitions are non-commercial, the operations and machines necessary for their manufacture are almost entirely standard, and the average manufacturer will understand his war-time task more quickly and be better able to judge his manufacturing capacity if the problem is put to him in terms of machine-hours and operations required.

The procedure is this: Based on actual manufacturing experience, a sound, simple and generally applicable method of production is first worked out. This method is then described in terms of operations that can be performed on the smallest appropriate machine, stating the unit machine-hour requirements. This data is then arranged in a form that makes of it a "measuring stick" which the surveying personnel can utilize to uncover and evaluate available capacity. With machine requirements for an article known, the suitability of a plant for its production can be determined almost at a glance. With the average unit machine-hour requirements also known, and the available machine hours computed, the units of production obtainable from the available machines can be readily ascertained and the present total capacity easily judged. The reverse calculations—all simple arithmetic—show equipment shortages.

The manufacturer is not asked if he can make some article, the very name of which is bewildering. Instead, the job is reduced to minimum sizes of drill-press hours, milling-machine hours, screw-machine hours, and so on.

Machine tool and equipment builders will be particularly interested in the plan. By encouraging the widest use of existing and available machine tools and equipment, it will not only do much to solve for the War Department the problem of early production, but it will also minimize the purchases of new machines at the start while installed and available machinery stands idle, thus decreasing the load on machine tool builders in the event of war. It follows that this not only will decrease the amount of post-war machinery thrown on the market, thus sparing a repetition of a ruinous post-war market, but will actually accelerate machinery purchases immediately following a war, because machines will have been worn out by the speeded-up production of munitions.

Factors to Consider in Buying Machine Tools

In addition to taking into account the value of new equipment from the point of view of quality, productive capacity, and price, there are a number of other factors that should be considered in buying machine tools and other shop equipment. One of these considerations is: Will the builder be able to render satisfactory service for the machine over a period of years? Another is delivery. Machines may have to be selected because they can be delivered at an early date if they are urgently needed.

Tool and fixture costs must not be overlooked. In one instance, a machine costing $5000 required tooling equipment costing $4500 to perform work equal to that done by a $6000 machine that needed only $1000 worth of tooling. In this case, the higher-priced machine was decidedly the cheaper one—not only in first cost, but because of the great saving realized every time the work performed on it had to be changed.

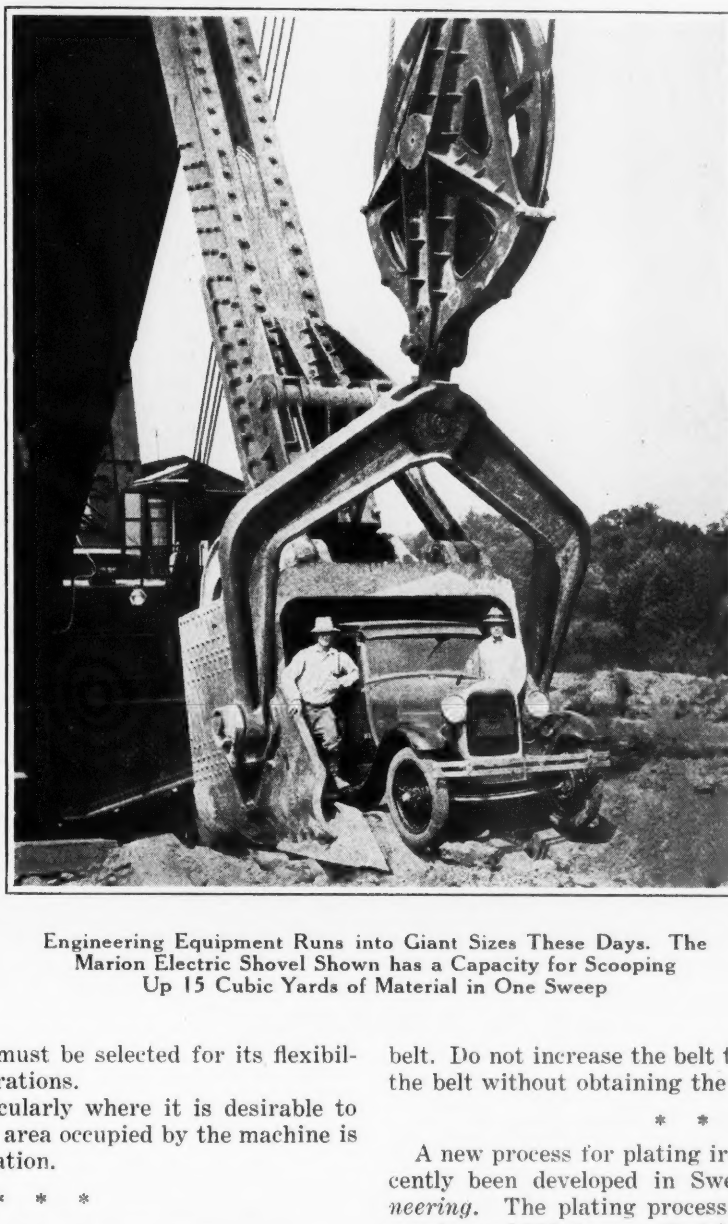
When the tooling on machines has to be changed very often for making different parts or performing different operations on the same part, the set-up time of the tooling equipment becomes important; and in shops where the production is not sufficient to keep a machine steadily on one job, the equipment must be selected for its flexibility to suit different operations.

In large plants, particularly where it is desirable to conserve floor space, the area occupied by the machine is an item worth consideration.

* * *

Chuck and Chuck Jaw Standardization

The proposed American Standard for chucks and chuck jaws is being distributed by the American Society of Mechanical Engineers for criticism and comment. This proposal contemplates the standardization of chuck diameters in eleven sizes—from 6 to 36 inches. Those who wish to examine this tentative draft of the proposed standard with a view to making comments to the committee may obtain copies by addressing their request to C. B. LePage, Assistant Secretary, American Society of Mechanical Engineers, 29 W. 39th St., New York City.



Engineering Equipment Runs into Giant Sizes These Days. The Marion Electric Shovel Shown has a Capacity for Scooping Up 15 Cubic Yards of Material in One Sweep

How to Increase the Life of Belt Conveyors

Five points to be observed for increasing the life of belt conveyors are emphasized by W. E. Philips, engineer of the Link-Belt Co., Chicago, Ill. These five points are:

1. Lubrication.—The bearings of the conveyor rollers should be greased with the proper kind of grease at reasonable intervals.

2. Cleanliness.—The space under the belt and under the idlers should be kept clean.

3. Loading.—Do not overload. Use sufficiently heavy idlers and belts for the service required. See that the material to be carried reaches the belt in the same direction as that in which the belt is moving, and with as little impact as possible.

4. Wear.—See that belt does not scrape against the framework, skirtboards, or wedged material. Dragging idlers caused by insufficient lubrication cause undue wear.

5. Training the Belt.—Train the belt to run straight while empty. Then, if it runs out of line when loaded, it is because of unequal loading. See that the belt is in contact with the center roll of the idler, because this roll steers the belt. The mounting of the idlers should be firm and secure. Side or guide idlers should not be used when training the belt. Do not increase the belt tension, as this will injure the belt without obtaining the desired results.

* * *

A new process for plating iron with aluminum has recently been developed in Sweden, according to *Engineering*. The plating process is carried out at a temperature of 900 degrees C. (about 1650 degrees F.). It is said that the aluminum ont only covers the surface of the iron effectively, but penetrates into the base metal to a certain extent. The resultant product resists oxidation and the influence of corroding gases and fluids. The process has been subjected to a series of tests at the Sandviken Iron & Steel Works, Sandviken, Sweden, which concern has acquired the sole rights for the Scandinavian countries in connection with the manufacture of cold-drawn tubing and strip iron. Experiments are also being carried on with the process in connection with the manufacture of kitchen ranges.

Personals

James S. Witmer, who has been sales manager of the J. I. Case Co., Racine, Wis., since 1916, has become assistant to the president, C. R. Messinger, of the Oliver Farm Equipment Co., Chicago, Ill.

Walter W. Bertram has been appointed sales manager of the industrial chain division of the Morse Chain Co., Ithaca, N. Y. Mr. Bertram has been with the Morse Chain Co. for eighteen years, the last eight years having served as manager of the New York office. A. B. Wray, formerly sales manager, has been made chief engineer in charge of all industrial chain engineering.

Walter W. Bertram

R. W. Appleton has been made purchasing agent of Morse Chain Co., subsidiary of Borg-Warner Corporation, at Ithaca, N. Y. Mr. Appleton was formerly director of purchases of the Pierce-Arrow Motor Car Co.

G. O. Johnson, formerly mechanical engineer and general manager of the Sidway-Topliff Co., Elkhart, Ind., has recently become associated with the Loshbough-Jordan Tool & Machine Co. of the same city, as mechanical engineer.

T. S. Perkins has been made general manager of merchandising engineering of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Mr. Perkins has been with the Westinghouse organization since his graduation from the Worcester Technical Institute in 1893.

Walter H. Wiewel has been made sales manager of the Timken Steel & Tube Co., Canton, Ohio, in place of A. J. Sanford, who has resigned. Mr. Wiewel has been associated with the company for several years as manager of steel sales in New York City. He will make his headquarters at Canton.

D. S. Brisbin, general manager of sales of the Chisholm-Moore Hoist Corporation, Tonawanda, N. Y., was elected chairman of the Electric Hoist Manufacturers' Association at a recent meeting in New York City. William White, of the Euclid Crane & Hoist Co., Euclid, Ohio, was elected vice-chairman.

William J. Linn, export manager of the Cleveland Pneumatic Tool Co. and the Cleveland Rock Drill Co., associated concerns in the manufacture of pneumatic-operated tools, machinery, and accessories for the automotive, aeronautical, oil, mining, and other industries, has been made vice-president of the Cleveland Export Club.

Edward C. Gainsborg has become associated with the Roller Bearing Company of America, Whitehead Road, Trenton, N. J., as sales manager of the industrial division. Mr. Gainsborg was connected with SKF Industries for over ten years, and was manager of that company's steel mill division and of its Pittsburgh office.

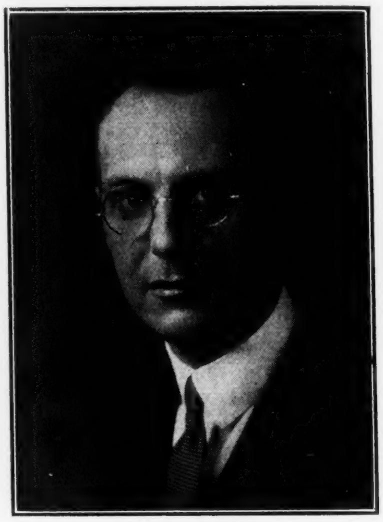
J. B. MacNeill has been appointed general manager of distribution engineering of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Mr. MacNeill is a graduate of the Lowell Institute and of the Massachusetts Institute of Technology, and has been continuously in the employ of the Westinghouse company since 1913.

Alfred F. Howe has been made western sales manager of the Borden Co., Warren, Ohio. Mr. Howe will make his headquarters at 717 Calmar Ave., Oakland, Calif. Five years ago he was associated with the company as vice-president and general sales manager, and severed his connection at that time in order to go to the western coast, where he formed sales connections with a number of eastern firms.

George G. Landis has been appointed chief engineer of the Lincoln Electric Co., Cleveland, Ohio, manufacturer of Stable-Arc welders and Linc-Weld motors. Mr. Landis became connected with the company eight years ago, when he was placed in charge of the experimental activities. He was later placed in charge of electric design for both motors and arc welders, and some time afterward was given charge of mechanical design. Many patents held by his employers are the result of his efforts.

George G. Landis

Edward C. Bullard, vice-president and a director of the Bullard Company, Bridgeport, Conn., has been appointed general manager of the company to succeed his uncle, the late Stanley H. Bullard. Edward C. Bullard graduated, with honors, from the Sheffield Scientific School of Yale University in 1917. After having been in the service of the nation during the World War, he worked in a number of departments in the Bullard Company's plant, and in 1926, he was made assistant to his father, Dudley B. Bullard, chief engineer of the company. Three years later he was appointed engineer in charge of design and research, and in 1930, he was elected a vice-president of the company. Mr. Bullard is the oldest grandson of the founder of the Bullard Company, Edward Payson Bullard.



Edward C. Bullard

Frank C. Reed, general sales manager of the Westinghouse Electric Elevator Co., Chicago, Ill., has been elected vice-president of the company in place of R. I. Phillips, who has resigned. In 1903, immediately upon graduating from the Massachusetts Institute of Technology, Mr. Reed entered the apprentice school of the Westinghouse company, and has been associated with that organization ever since.

L. M. Dunning has been appointed sales representative of the Chicago office of the Reliance Electric & Engineering Co., Cleveland, Ohio, manufacturer of alternating- and direct-current motors. Herbert A. Holmes has been made sales representative of the Pittsburgh office, M. C. Suerken, sales representative of the New York office, and Robert M. FitzGerald, sales representative of the Philadelphia office.

DR. OSCAR C. BRIDGEMAN, research associate of the Bureau of Standards, Washington, D. C., has been awarded the Manly memorial medal, presented annually by the Society of Automotive Engineers to the author of the best paper relating to theory or practice in the design or construction of, or research on, aeronautic power plants or their parts or accessories. The subject of Dr. Bridgeman's paper was "The Effect of Airplane Fuel Line Design on Vapor Lock."

FRANCIS HODGKINSON, consulting mechanical engineer of the Westinghouse Electric & Mfg. Co., South Philadelphia Works, has been awarded the Willans Premium, a distinguished British engineering honor, by the Institution of Mechanical Engineers of London. The award was given for the best paper published in the Proceedings of the Institute from 1925 to 1930, and is in the form of a gold medal. Mr. Hodgkinson's paper was on the subject of journal bearing practice.

WILLIAM G. PRAED has been appointed radiograph engineer of the Claud S. Gordon Co.'s commercial X-ray laboratory located at 2416 W. 15th Place, Chicago, Ill. Mr. Praed was with the Bethlehem Steel Co. during the war, and has since been employed by the Link-Belt Co. of Indianapolis in a number of capacities, most recently as assistant to the general superintendent. He has twice been chairman of the Indianapolis Chapter of the American Society for Steel Treating.

T. P. WRIGHT, chief engineer of the Airplane Division of the Curtiss Aeroplane & Motor Corporation, Garden City, N. Y., was awarded the Wright Brothers medal, which is presented by the Society of Automotive Engineers annually to the author of the best paper on aerodynamics or structural theory or research, or airplane design or construction presented before the Society. Mr. Wright's prize-winning paper dealt with the subject "Development of a Safe Airplane—the Curtiss Tanager."

Obituaries

William Ganschow

William Ganschow, second vice-president of Gears & Forgings, Inc., Cleveland, Ohio, died suddenly at his home in Chicago, Ill., on April 7, aged fifty-five years. Mr. Ganschow was a native and life-long resident of Chicago, and was a prominent figure not only in the industry in which he was engaged, but also in civic affairs.

Mr. Ganschow's father founded the William Ganschow Co. in Chicago as an industrial gear company over fifty years ago. The son, William, was made president of the company upon the death of his father, and continued in this capacity until 1928, when the William Ganschow Co. merged with the Van Dorn & Dutton Co. and the Ohio Forge Co., of Cleveland, and the Fawcus Machine Co. of Pittsburgh, to form the present company, which is known as Gears & Forgings, Inc. At that time he was placed in charge of the Chicago operations.

William Ganschow

Mr. Ganschow was affiliated with the American Gear Manufacturers' Association from its inception. He served as a member of its first general standardization committee, and was at one time a member of its governing board. He was also an active figure in the National Metal Trades Association.

Frederick W. Bruch

Frederick W. Bruch, president of the Acme Machinery Co., Cleveland, Ohio, and one of its founders, died April 1 at the age of seventy-nine. Mr. Bruch was born in Bavaria, Germany, and came to this country with his parents while still a child. He was brought up in Cleveland, and received his education in the public schools of that city, afterward learning the machinist's trade, which he followed for several years. He then entered into a partnership with Claus Greve and Daniel Luehrs under the name of the Acme Company. The partnership was incorporated as a company in 1892.

Mr. Bruch was the only surviving member of the original partnership, and was active in the affairs of the company until shortly before his death. He was also affiliated with various Cleveland manufacturing companies as a director. He is survived by two sons, Carl F. and Edward P. Bruch, the former vice-president and the latter a director of the Acme Machinery Co.

DANIEL H. DEYOE of the industrial engineering department of the General Electric Co., Schenectady, N. Y., a director and member of the American Welding Society, and a figure for many years identified with electric arc-welding activities, died in Schenectady, April 11, at the age of fifty-five. Mr. Deyoe was a graduate of Union College, class of 1898, and joined the General Electric organization in the same year. He became affiliated with the industrial engineering department in 1906.

ROY GEE CARTER, secretary of the Sibley Machine Co., South Bend, Ind., died March 20. Mr. Carter had been connected with the Sibley Machine Co. for the last twenty-one years.

Shock Absorber Parts Rough-bored on New Britain Chucking Machines

In March MACHINERY, page 521, an article was published entitled "Accurate Boring and Threading Operations," describing the manufacture of hydraulic shock absorber parts. The second paragraph of the article stated: "Identical rough- and finish-boring operations are performed in separate lathes." We have been informed that this statement is not correct. The rough-boring operation is performed on New Britain four-spindle chucking machines. The accuracy of the roughing operation performed in this manner makes it possible to use the simplified finish-boring tool described.

American Manufacturers Export Association Organized

The American Manufacturers Export Association, formed to promote the sales of American products abroad, has been organized by 900 leading manufacturers engaged in export trade. The headquarters of the Association are at 401 Broadway, New York City. Frank R. Eldridge, executive vice-president, in a recent statement pointed out the need for a concerted movement to sell American goods abroad. The object of the Association is to acquaint foreign buyers with our products and to bring buyer and seller together. A "Register of American Exporters" is published, which is distributed to 50,000 foreign buyers and which lists the machinery manufacturing exporters who are members.

* * *

Gray Iron Institute Reports Gain in Business

"The February report of the Gray Iron Institute is the first in eight months in which an increase is shown in all three of the important items—production, new business, and unfilled orders. The February business of the members of the Gray Iron Institute shows a very nice increase over January, which month showed a perceptible gain over December."—*Arthur J. Tuscany, Manager, Gray Iron Institute, Inc.*

Goddard & Goddard Serrated-blade Reamers

In the description of the Goddard & Goddard serrated-blade reamers published on page 635 of April MACHINERY, the last sentence in the second paragraph should have read as follows: "Finally, the cams are locked with a 90-degree turn anti-clockwise, and the set-screw in the adjusting nut is re-tightened."

The last paragraph of the description should read as follows: "Long blade life is insured by this design. One-inch reamers have an 'expansion life' of 0.187 inch; 2-inch reamers, 0.250 inch; 3-inch reamers, 0.442 inch; and reamers 4 1/2 inches and over, 0.625 inch."

News of the Industry

GEOMETRIC TOOL CO., New Haven, Conn., manufacturer of machinery and tools for cutting screw threads, has appointed J. C. Ross & Co., 2207 First Ave., South, Seattle, Wash., exclusive selling agent for the company in the states of Washington and Oregon.

NORTHERN ENGINEERING WORKS, 210 Chene St., Detroit, Mich., have opened an office at Cleveland, Ohio, in the Fidelity Bldg., 1940 E. 6th St., where they will be in a position to give quick service to the users of Northern cranes, hoists, and other equipment.

SHEPARD NILES CRANE & HOIST CORPORATION, 380 Schuyler Ave., Montour Falls, N. Y., has appointed the Elliott Electric Co., 2178 W. 25th St., Cleveland, Ohio, and A. G. Acker, 1409 Keystone Bldg., Pittsburgh, Pa., local representatives for Sprague electric hoists and winches.

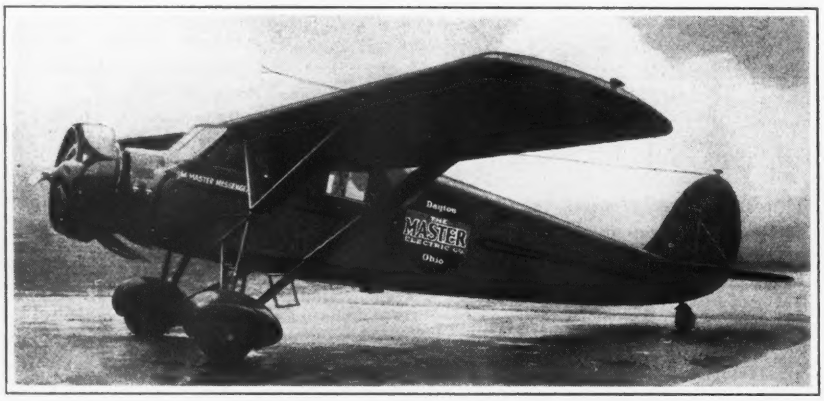
AMERICAN CHAIN CO., INC., Bridgeport, Conn., announces that one of its subsidiaries, the American Cable Co., has granted the American Steel & Wire Co., Chicago, Ill., the right to manufacture pre-formed wire rope under a license agreement, the patent covering this material being owned by the American Cable Co.

FOOTE BROS. GEAR & MACHINE CO., Chicago, Ill., has removed its general offices from 111 N. Canal St. to 215 N. Curtis St. This removal has been made in order to coordinate the general offices and manufacturing department, in the interests of better service to customers and economy of operation.

MCINNES STEEL CO., Corry, Pa., manufacturer of hammered crucible tool steels, announces the election of the following officers: F. E. Whittlesey, president; Colin McInnes, vice-president in charge of sales; Harry B. Smith, secretary and general manager; and A. G. Postlethwait, treasurer. Edwin J. Lewis has been made plant superintendent.

LINK-BELT CO., 300 W. Pershing Road, Chicago, Ill., at a recent meeting of the stockholders, elected three additional members to the board of directors as follows: Arthur L. Livermore, attorney, of New York City; George P. Torrence, vice-president of the company in charge of the Indianapolis plant; and Richard W. Yerkes, secretary and treasurer of the company.

MASTER ELECTRIC CO., Dayton, Ohio, manufacturer of motors and other electrical devices, recently purchased a four-passenger cabin monoplane which will be placed in service immediately to promote more rapid contact with customers and the trade generally. The plane is called "The Master Messenger."



"The Master Messenger," an Airplane Used by the Master Electric Co. for Providing More Rapid Contact with Customers and Quicker Service to the Trade Generally

LINCOLN ELECTRIC CO., Cleveland, Ohio, manufacturer of Stable-Arc welders and Linc-Weld motors, announces the removal of its Chicago office from 53 W. Jackson Blvd., to a new building at 1455 W. 37th St. The new quarters will afford additional space for the sales and service of the line of welding equipment and motors made by the concern, and will provide additional storage space.

PFANSTIEHL CHEMICAL CO., Waukegan, Ill., is appointing local representatives throughout the country to represent the division of the business that manufactures and markets the line of "SpecO" soldering pastes, salts, sticks, and sal-ammoniac. Among the representatives appointed is Wood & Anderson, 915 Olive St., St. Louis, Mo., whose territory will include southern Illinois, Missouri, Iowa, Kansas, and Nebraska.

E. F. HOUGHTON & CO., Philadelphia, Pa., manufacturers of oil and leather for the industries, at a recent meeting of the stockholders, re-elected L. E. Murphy president. At the annual meeting of the board of directors, A. E. Carpenter was elected first vice-president and treasurer; G. W. Pressell, second vice-president and secretary; C. P. Stocke, assistant secretary; and Miss M. M. Menningen, assistant treasurer.

PENN HEAT CONTROL CO., Philadelphia, Pa., has been organized to take over all the assets, including patents and good will, of the PENN HEAT CONTROL CORPORATION, a company specializing in apparatus for the automatic regulation of temperature in household heating. The new company will retain the personnel and organization of the old corporation. The General Electric Co., Schenectady, N. Y., has a controlling interest in this concern.

JONES & LAUGHLIN STEEL CORPORATION, Pittsburgh, Pa., has purchased the Lukens Steel Co.'s plant at New Orleans, La. The Lukens warehouse and fabricating shop cover a site of approximately seventeen acres. This plant will give the Jones & Laughlin Steel Corporation a large modern fabricating, warehousing, and distributing base at the mouth of the Mississippi River, which can be served directly by river transportation from Pittsburgh, as well as by rail.

DEVILBISS CO., Toledo, Ohio, manufacturer of spray-painting and spray-finishing equipment, announces the establishment of a training school for the spray method of applying paints. The school, located at the company's plant in Toledo, is open to owners, users, and distributors of the DeVilbiss equipment without cost. Those interested should send a written application to the company. The minimum length of the course is three days, but it is preferred that students remain one week.

TUNGSTEN WIDIA TOOL CORPORATION OF AMERICA, 333 W. 52nd St., New York City, has secured the rights to use certain processes (on which patents are pending) for brazing Widia tips to their shanks and for eliminating excessive heating at the tips while in operation. This company, formed in December, 1929, by Morris Simons, president, is operating under a license agreement—exclusive except for one other concern—with the Krupp Co., who furnish all the Widia tips for their various types of cutting, sawing, rolling, and bending tools. The Tungsten Widia Tool Corporation of America is closely affiliated with the Union Wire Die Corporation

Harry A. Baugh

of New York, who are pioneers in introducing tungsten carbide as a cutting alloy in the United States.

SHEPARD NILES CRANE & HOIST CORPORATION, Montour Falls, N. Y., has recently moved its sales offices in Pittsburgh to the Grant Building, Rooms 1524 and 1525. Roy M. Hurst, who has been connected with the company for many years and was until recently in the New York office, will be in charge of the Pittsburgh office as district manager. He will have associated with him Frank J. Kinney, who has represented the company for many years in the Pittsburgh territory. The Cleveland sales office of the company has also been removed to 1433 E. 12th St. Harry A. Baugh is in charge as district manager. Mr. Baugh was recently in the Chicago office, and for many years was district manager of the Pittsburgh office.

Roy M. Hurst

Coming Events

MAY 4-9 — Thirteenth Exposition of the Chemical Industries to be held at the Grand Central Palace, New York City.

MAY 4-9—Annual meeting of the American Foundrymen's Association, to be held at the Stevens Hotel, Chicago, Ill. In conjunction with the meeting, a limited exhibition of foundry equipment and supplies will be held. The office of the executive secretary is 222 W. Adams St., Chicago, Ill.

MAY 5-6—Meeting of the Petroleum Division of the American Society of Mechanical Engineers at Hotel Winfield Scott, Elizabeth, N. J. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

MAY 7-8—Production Meeting of the Society of Automotive Engineers and the Milwaukee Section of the Society to be held at the Hotel Schroeder, Milwaukee, Wis. R. S. Burnett, director of production activity, Society of Automotive Engineers, 29 W. 39th St., New York.

MAY 7-9—Fifteenth annual meeting of the American Gear Manufacturers' Association at the Hotel Statler, Buffalo, N. Y. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

MAY 27-29—Annual convention of the National Foreign Trade Council to be held at the Hotel Commodore, New York City. O. K. Davis, secretary, 1 Hanover Square, New York.

JUNE 1-3—Regional meeting of the American Society of Mechanical Engineers at Hartford, Conn. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

JUNE 12-13—Eighth annual convention of the National Association of Foremen at the Biltmore Hotel, Dayton, Ohio. E. H. Tingley, secretary, Refiners Bldg., Dayton, Ohio.

JUNE 15-19—Summer meeting of the Society of Automotive Engineers at White Sulphur Springs, W. Va. John A. C. Warner, secretary, 29 W. 39th St., New York City.

JUNE 17-19—Convention of the Steel Founders' Society of America at French Lick Springs, Ind. G. P. Rogers, managing director, 932 Graybar Bldg., New York City.

JUNE 22-26—Annual meeting of the American Society for Testing Materials at the Stevens Hotel, Chicago, Ill. C. L. Warwick, secretary-treasurer, 1315 Spruce St.. Philadelphia, Pa.

AUGUST 23-29—International Industrial Relations Congress to be held at Amsterdam, Holland. Further information may be obtained from Mary van Kleeck, Russell Sage Foundation Bldg., New York City.

SEPTEMBER 21-25—Annual meeting of the American Society for Steel Treating and National Metal Exposition to be held at the Commonwealth Pier, Boston, Mass. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

OCTOBER 13-16—Twenty-fifth annual convention of the Illuminating Engineering Society at the William Penn Hotel, Pittsburgh, Pa. For further information, apply to the secretary, Illuminating Engineering Society, 29 W. 39th St., New York City.

NOVEMBER 30-DECEMBER 5—First National Exposition of Mechanical Handling Equipment to be held at the Grand Central Palace, New York City. Charles F. Roth, Manager, International Exposition Co., Grand Central Palace, New York City.

New Catalogues and Circulars

TOOL STEEL. McInnes Steel Co., Corry, Pa. Catalogue entitled "Hammered Crucible Tool Steels," listing tool steels for practically every purpose.

LATHES. South Bend Lathe Works, 722 E. Madison St., South Bend, Ind. Handbook No. 44 for the Mechanic, covering the 1930 new model South Bend precision lathes.

ELECTRIC FITTINGS. Crouse-Hinds Co., Syracuse, N. Y. Bulletin 2218, containing data on threadless condulets, couplings, and connectors for rigid conduit and electrical metallic tubing.

BALL BEARINGS. New Departure Mfg. Co., Bristol, Conn. Circular 195FE, containing a reprint of an article entitled "Procedure in Preloading Bearings," from the *American Machinist*.

LUBRICATING SYSTEM. Ideal Lubricator Co., Packard Bldg., Philadelphia, Pa. Circular descriptive of the "Ideal System" of lubrication, a constant and controlled system for applying grease to bearings.

SPECIAL LATHES. Greaves Machine Tool Co., Cincinnati, Ohio. Circular illustrating and describing the Greaves brake-drum and flywheel lathes, which are suitable for any size of automobile brake-drums and flywheels.

WIRE-FORMING EQUIPMENT. Baird Machine Co., Bridgeport, Conn. Circular illustrating the Baird four-slide wire-forming machine and products for which it is adapted, as well as Baird tumbling equipment.

MATERIAL-HANDLING EQUIPMENT. Link-Belt Co., 300 W. Pershing Road, Chicago, Ill. Bulletin describing the details of construction of the Link-Belt manganese steel apron feeder designed for heavy-duty service.

BELTING. Chas. A. Schieren Co., 73 Ferry St., New York City. Bulletin containing a non-technical explanation of the effect of belt tensions on the cost of belting, together with a brief summary of all factors entering into belt costs.

BALANCING EQUIPMENT. Gisholt Machine Co., 1209 E. Washington Ave., Madison, Wis. Bulletin 61, describing how the balancing time on a certain job was reduced 95 per cent by the use of the Gisholt static balancing machine.

MATERIAL HANDLING EQUIPMENT. Cleveland Electric Tramrail Division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio. Circular illustrating applications of the Cleveland tramrail for moving various classes of materials.

GRINDING EQUIPMENT. Norton Co., Worcester, Mass. Bulletin entitled "Grinding and Heat-treatment as Causes of Cracks in Hardened Steels," containing the results of a test recently conducted to obtain information on this subject.

UNIVERSAL TOOL GRINDERS. Gisholt Machine Co., 1209 E. Washington Ave., Madison, Wis. Circular illustrating the Gisholt universal tool grinder, which is designed to grind angles on single-point cutting tools accurately and economically.

PAINTING EQUIPMENT. Paasche Airbrush Co., 1909-23 Diversey Parkway, Chicago, Ill. Circulars illustrating and describing Paasche "Clamptight" pressure feed paint tanks; ½-horsepower portable air-painting unit; and multiple head airbrushes.

BAND SAWS. William Laidlaw, Inc., Belmont, N. Y. Circular descriptive of the Laidlaw Type JM metal-cutting band saw with hydraulic feed, which is suitable for use both in tool-rooms having a variety of cutting to do and in regular production work.

OIL BURNERS. Naudain Mfg. Co., 1001 Rectory Lane, Baltimore, Md. Circular illustrating and describing the Naudain rapid heating oil burner, which burns all grades of fuel oil and is especially suitable for heating, welding, forging, and melting furnaces.

HEATING AND VENTILATING EQUIPMENT. Reznor Mfg. Co., Mercer, Pa. Catalogue illustrating and describing the Reznor gas-fired warm-air forced-circulation heater. Catalogue descriptive of the Reznor gas-fired warm-air heating and ventilating unit.

THREADING MACHINES. Landis Machine Co., Inc., Waynesboro, Pa. Bulletin H-75, illustrating and describing the salient features of the 1- and 1½-inch single- and double-head Landmaco threading machines. Complete specifications of the two sizes are included.

TUBE COUPLINGS. Parker Appliance Co., 10320 Berea Road, Cleveland, Ohio. Leaflet illustrating the standard shapes of Parker tube couplings. The circular describes the details of construction of this type of coupling and also contains data on fabricating tools and tube benders.

RECORDING INSTRUMENTS. Ohmer Fare Register Co., Dayton, Ohio. Circular descriptive of the principle of operation of the Ohmer-Kienzle Vibracorder for recording graphically the operation of commercial vehicles and machinery, showing the exact running time and idle time.

ROLLER CHAIN. Baldwin-Duckworth Chain Corporation, Worcester, Mass. Bulletin 40, covering steel replacement roller chain, designed to run over the same sprockets as the regular sizes of malleable detachable, riveted malleable, or saw mill malleable iron and steel combination chains.

TOOL-ROOM LATHES. Lodge & Shipley Machine Tool Co., Cincinnati, Ohio. Circular illustrating the Lodge & Shipley selective-head tool-room lathe, which is made in 12- and 14-inch sizes. Complete specifications and a large number of illustrations showing the various details are included.

UNIVERSAL BORING MACHINES. Universal Boring Machine Co., Hudson, Mass. Bulletin 42, illustrating and describing this company's No. 50 universal boring machine, which has a 5-inch spindle or main boring-bar. The construction is clearly shown by full-page illustrations.

MOTORS. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Leaflet 20519, descriptive of the Type HR Simplex synchronous motors, which are designed for driving low-speed, constant-speed machinery where low starting current combined with high starting and pull-in torque is required.

NICKEL STEEL. International Nickel Co., Inc., 67 Wall St., New York City. Folder No. 8 in a series on the use and application of nickel steel in various industries. Among the parts shown are coal-cutting chain, heavy-duty steam drop-hammer, riveter, large gears, machinery clutch, propeller hub, etc.

HARD-FACING PRODUCTS. Armite Laboratories, 318 W. 9th St., Los Angeles, Calif. Catalogue of abrasion-resisting metals for the hard-facing of cutting tools and surfaces subjected to friction and abrasion. The catalogue covers materials and methods used in the recently developed process of hard-facing.

ALLOYED STEELS. Los Angeles Steel Casting Co., Ltd., 2444 S. Alameda St., Los Angeles, Calif. Circular entitled "Nikeladium and its Three Partners," announcing three new alloyed steels which have been designed to present various combinations of strength and toughness to fit special conditions of service.

ROLLER CHAIN. Diamond Chain & Mfg. Co., 409 Kentucky Ave., Indianapolis, Ind. Booklet entitled "Simplifying and Improving Machine Design," containing information on roller chain usage. The eight classes of transmission application in which Diamond drives are particularly important are described and illustrated.

TURRET LATHES. Gisholt Machine Co., 1209 E. Washington Ave., Madison, Wis. Loose-leaf bulletins Nos. 60, 62, and 63, illustrating the machining of impeller conical faces, chuck bodies, and alloy steel screws on the Gisholt 2L high-production turret lathe, 3AL heavy-duty turret lathe, and IL high-production turret lathe, respectively.

CUTTER AND TOOL GRINDERS. Cincinnati Milling Machine Co., Cincinnati, Ohio. Operator's Instruction Book for No. 2 Cutter and Tool Grinder. This is actually a text-book on the operation of the machine referred to, and contains many helpful tables and hints pertaining to the set-up and use of this machine. The book covers 52 pages, 6 by 9 inches.

MOTORS. Roth Bros. & Co., 1400 W. Adams St., Chicago, Ill. Loose-leaf circular descriptive of Century Roth motor-generator sets, which are built for applications where the kind of current or voltage needed differs from that ordinarily available. They are made in sizes of from 50 watts to 100 kilowatts, direct current, and from 0.5 to 40 kilovolt-amperes, alternating current.

POWER TRANSMISSION APPLIANCES. Henry Lindahl Foundry & Machine Co., 5900 Ogden Ave., Chicago, Ill. Catalogue 24, covering the complete line of machine-molded pulleys, conveyor pulleys, ball-bearing pulleys, and various types of sheaves made by this company. The pamphlet also gives complete information and tables for designing V-belt drives, together with price lists of sheaves and belts.

INDICATING, RECORDING, AND CONTROLLING INSTRUMENTS. Brown Instrument Co., 4485 Wayne Ave., Philadelphia, Pa. Catalogue 8008, containing data on Brown automatic control for temperatures, pressures, flows, liquid levels, and other operating factors. The catalogue shows how temperature controls can be applied to all types of furnaces, kilns, ovens, kettles, etc., whether electric, gas-fired, oil-fired, or coal-fired, in a variety of industries.

SMALL TOOLS. Ex-Cell-O Aircraft & Tool Corporation, 1200 Oakman Blvd., Detroit, Mich. Bulletin describing the plant, personnel, and products of this company, among which may be mentioned broaches, grinding spindles, milling cutters, taps, aircraft engine parts, special machines, etc. So comprehensive is the description of this organization that those making use of this class of tools will find the bulletin almost as interesting as a trip to the plant.

CUTTING-OFF MACHINES. A. P. deSanno & Son, 1615 McKean St., Philadelphia, Pa. Catalogue illustrating and describing the Radiac cut-off machine, which is capable of cutting any type of metal or fibrous material up to 2 inches in diameter. The catalogue contains specific figures showing the time taken on this machine for cutting a variety of materials, including unannealed stainless steel, chrome-molybdenum, coiled spring stock, high-speed steel, Swedish steel, pure gum rubber, brass, etc. One of the features of the catalogue is a condensed reference chart, listing the various materials, cuts per disk, actual cutting time, and disk size.

PHOTOGRAPHIC EQUIPMENT. Eastman Kodak Co., Rochester, N. Y., is publishing a new magazine called *Applied Photography* which is issued as part of an extensive program to assist industrial and business firms in applying photography effectively in research, manufacturing, advertising, and sales work. The scope of the new magazine includes the industrial applications of still and motion pictures, photomicrography, radiography, and other forms of photography. Each issue will present a different business objective and will illustrate how photography can aid in attaining it. The first issue (May) deals with the question of obtaining photographs for advertising and sales purposes. The magazine will be sent to executives in charge of advertising, sales, research, and factory production.

New Books and Publications

STANDARDS YEARBOOK (1931). 399 pages, 6 by 9 inches. Published by the U. S. Department of Commerce, Washington, D. C., as Miscellaneous Publication No. 119 of the Bureau of Standards. Price, $1.

BELL-BOTTOM SCREW JACKS. 12 pages, 6 by 9 inches. Published by the U. S. Department of Commerce, Washington, D. C., as Simplified Practice Recommendation No. R97-30 of the Bureau of Standards. Price, 5 cents.

AN OPTICAL COINCIDENCE GAGE. By I. C. Gardner and F. A. Case. 9 pages, 6 by 9 inches. Published by the U. S. Department of Commerce, Washington, D. C., as Research Paper No. 272 of the Bureau of Standards. Price, 10 cents.

MATERIALS HANDBOOK. By George S. Brady. 588 pages, 4 by 7 inches. Published by the McGraw-Hill Book Co., 370 Seventh Ave., New York City. Price, $5.

This is the second edition of an encyclopedia of materials, arranged for purchasing agents, engineers, executives, and foremen. The present edition has been prepared especially with the needs of the product engineer in view. With this in mind, the items relating to engineering construction materials have been broadened to include enough comparative data on the physical properties to enable the designing engineer to judge the relative merits of the particular material for the requirement in hand. New materials have also been added.

THE AUTOBIOGRAPHY OF AN ENGINEER. By William LeRoy Emmet. 213 pages, 6 by 8 inches. Published by the Fort Orange Press, Albany, N. Y. Price, $2.

This is the autobiography of a man, well known in the engineering profession, who for the past forty-five years has played a leading part in various phases of electrical development. He was one of the famous quartette of General Electric creative engineers of whom the other three were Elihu Thomson, Charles P. Steinmetz, and Willis R. Whitney. It was largely through Mr. Emmet's tireless efforts that the steam turbine was brought to a place of dominating importance in the electrical industry. Among his important achievements were the promotion of the electrical propulsion of ships, and the invention, design, and development of the mercury vapor power system. The book, besides being an account of the life of a prominent engineer, contains interesting historical data on events and prominent figures of the period with which it deals.

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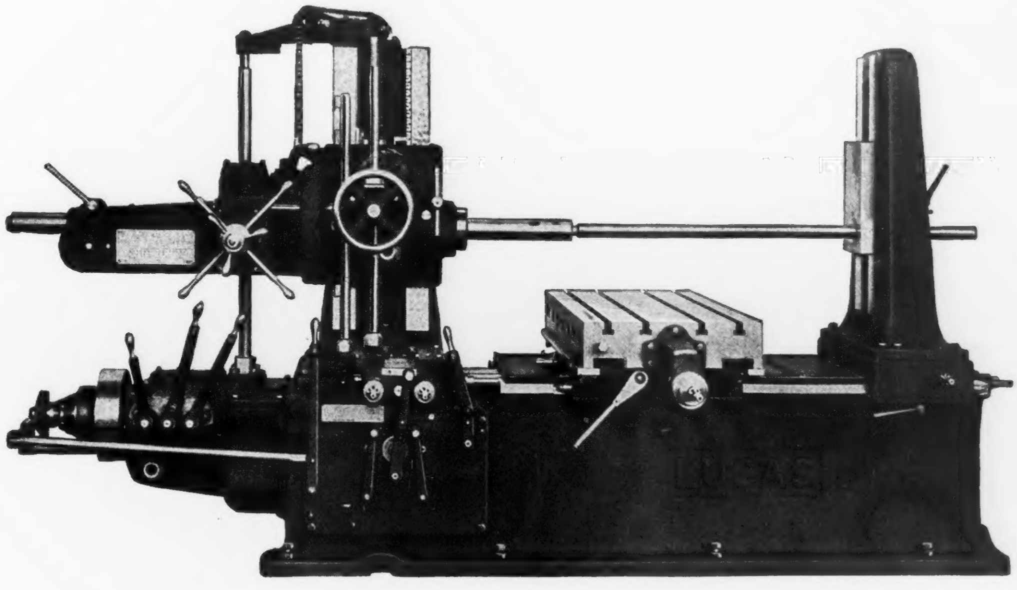

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Have You Ever Seen a Stress?

Now it is actually possible to look at stresses and see both their direction and intensity. For instance, one can see the stress changes that occur between rotating gear teeth. The leading article in June MACHINERY will tell all about this wonderful process, and will show some interesting stress pictures.